ber 1949

Chemical Industries

Including CHEMICAL SPECIALTIES

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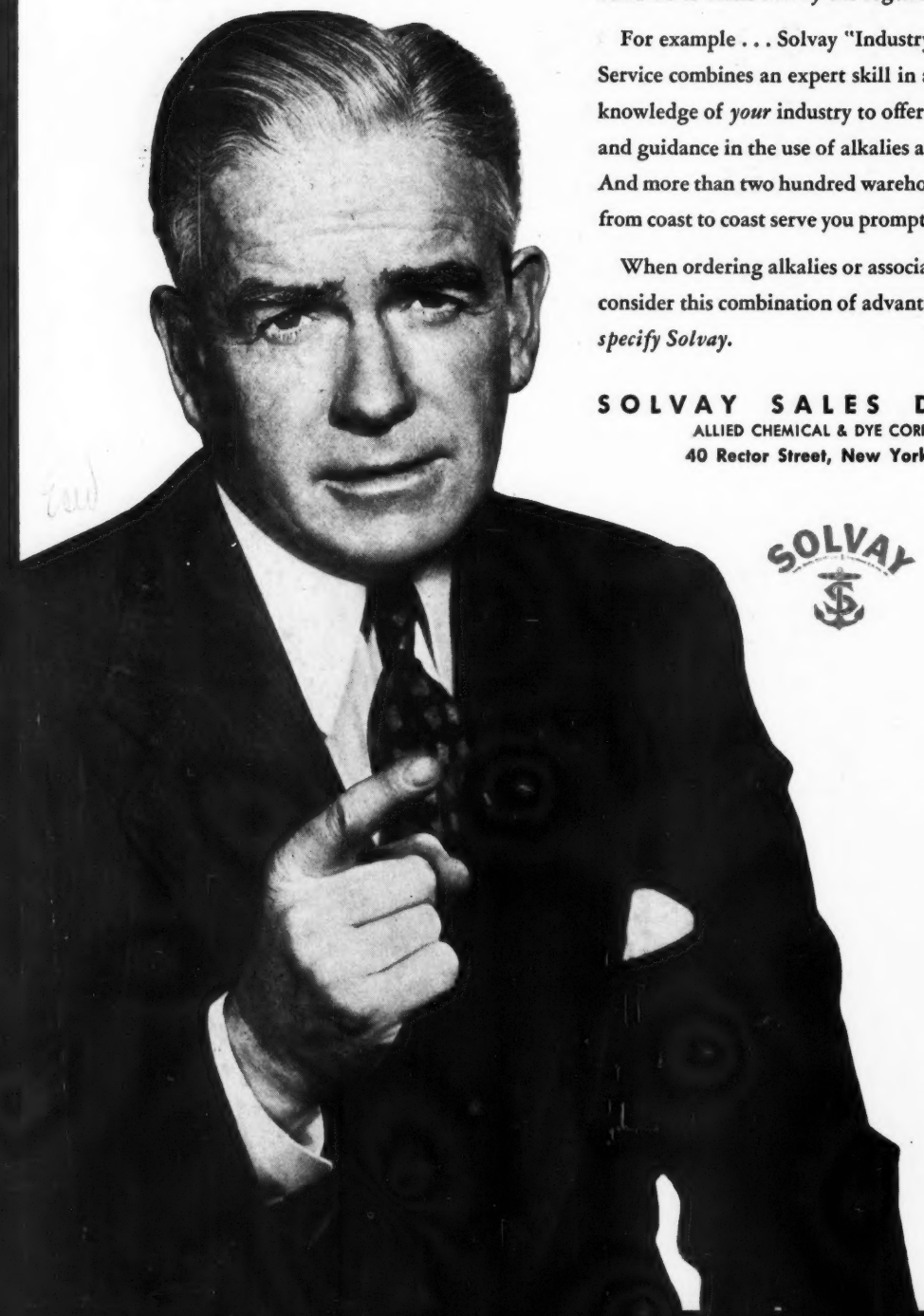
NEW USES, TEL GROWTH FORCE SODIUM EXPANSION — p. 714

Cover: Special tanks for sodium storage

"Why You Should Specify SOLVAY"



Chemicals are not bought on the basis of price and specifications alone. Other factors must be considered . . . plant facilities, plant locations, length of experience. Technical Service, convenience of warehouse locations for prompt and economical delivery. All these combine to make *Solvay* the logical choice for alkalies.

For example . . . Solvay "Industry-Wise" Technical Service combines an expert skill in alkalies with an intimate knowledge of *your* industry to offer invaluable counsel and guidance in the use of alkalies and associated chemicals. And more than two hundred warehouses and stock points from coast to coast serve you promptly and economically.

When ordering alkalies or associated chemicals, consider this combination of advantages and you, too, will *specify Solvay.*

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ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

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- Soda Ash
- Caustic Soda
- Caustic Potash
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- Nytron
- Sodium Bicarbonate
- Specialty Cleansers
- Ammonium Bicarbonate
- Sodium Nitrite
- Para-dichlorobenzene
- Ortho-dichlorobenzene
- Monochlorobenzene
- Methanol
- Ammonium Chloride
- Formaldehyde

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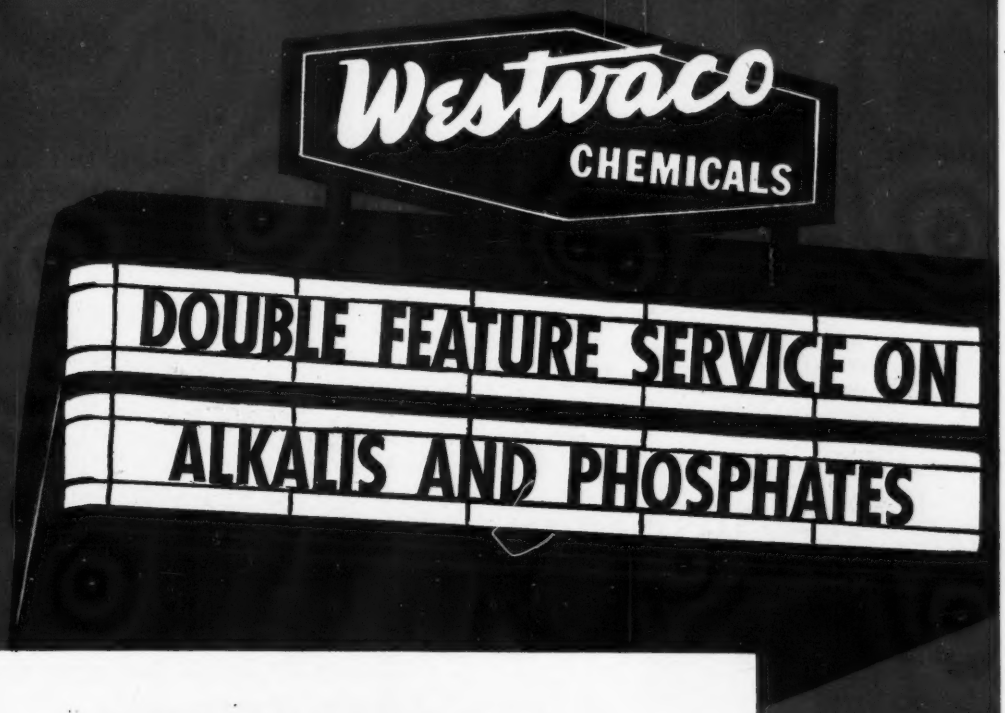
Saves TIME — INVENTORY — EFFORT



One order—One dependable source of supply covers your complete needs on

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CAUSTIC POTASH
Liquid 45-50%. Flake and Solid.

CAUSTIC SODA
Liquid 50% — Standard and Rayon Grades. Liquid 70-73%. Flake and Solid, 76% Na_2O.

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Sodium Tripolyphosphate
Disodium Phosphate
Monosodium Phosphate
Tetrasodium Pyrophosphate
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MIXTURES

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chemicals
are
basic
with
Mathieson...

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purity is basic—quality of product continues to be a prime Mathieson objective.

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Sulphuric Acid . . . Caustic Soda . . . Soda Ash . . . Bicarbonate of Soda . . . Liquid Chlorine . . . Chlorine Dioxide . . . Ammonia, Anhydrous & Aqua . . . HTH Products . . . Dry Ice . . . Carbonic Gas . . . Sodium Chlorite Products . . . Sodium Methylate

MATHIESON CHEMICAL CORPORATION
MATHIESON BUILDING, BALTIMORE 3, MD.

Chemical Industries

Including CHEMICAL SPECIALTIES

Vol. 65, No. 5

NOVEMBER 1949

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

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ABP ABC

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Plasticizer OF THE MONTH

DICAPRYL SEBACATE

PROPERTIES

Molecular Weight 426
Boiling Point 231.5-239°C @ 4 mm.
Specific Gravity 0.9136 @ 20°/20°C
Saybolt Viscosity 73.8 sec. @ 100°F
Color 0.5 NPA Maximum
Weight 7.62 lbs. per gal.

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Recommended very highly for use in synthetic resins and elastomers where the ultimate in performance is desired. It is unique in its combination of the following properties: Extreme low temperature performance, excellent resistance to water extraction, very low volatility, and excellent weathering. In addition, test results have shown it to be very non-toxic.

HARCHEM

PLASTICIZERS

DICAPRYL SEBACATE
DICAPRYL ADIPATE
DICAPRYL PHTHALATE
DIBUTYL SEBACATE
DI-ISO-OCTYL SEBACATE
DI-ISO-OCTYL ADIPATE
DI-ISO-OCTYL PHTHALATE
DIBENZYL SEBACATE
DIHEXYL SEBACATE
DIHEXYL ADIPATE
DIHEXYL PHTHALATE
DIMETHYL SEBACATE
BUTYL BENZYL SEBACATE
CAPRYL BENZYL SEBACATE

HARDESTY CHEMICAL CO., INC.

41 East Forty-second St., New York 17, N.Y.

THE READER WRITES

Not So Sure About Liquid SO_2 in Canada

To the Editor of Chemical Industries:

For nearly three years Canadian Industries Limited has been working in close collaboration with the International Nickel Co. of Canada Limited in the hope that it would be economic for C-I-L to produce liquefied sulfur dioxide from Inco's smelter gases. Because of my participation in this development, I was a little disturbed by reference made to it in the article prepared by William W. Hay under the title "What's Ahead for the Sulphur Industry" published in *Chemical Industries,* August, 1949.

From a perusal of Mr. Hay's excellent article, one can only infer that manufacture of liquefied sulfur dioxide in Canada is assured. Lest there be any misunderstanding, I should like to draw to your attention that such is not the case.

As you probably know, operation of a pilot plant for the production of liquefied sulfur dioxide was technically successful, but the entire future of the development will be governed by success or failure to provide economic distribution to a sufficient number of consuming pulp mills to justify installation of a commercial unit. No final decision to erect such a unit has as yet been taken.

J. D. CONVERSE
Canadian Industries Ltd.
Montreal, Canada

Suggested Reading For Voters

To the Editor of Chemical Industries:

The many truths in the article, "The Essential Element," by Crawford H. Greenewalt, president of Du Pont, on page 503 of your October issue, are known and recognized by those in the industry who have contributed to the "greatest array of productive equipment the world has ever seen." The drying up of venture capital is the most serious threat to the only true security that exists for this nation—and the world—since from such risk investment have sprung the only things in which we have need to be secure: the tools and the ability to do an honest day's work.

And the high tax policy of the government is the force that is destroying this wellspring of economic vitality. The savings are still there, but they have, in the words of Mr. Greenewalt, "been driven into essentially non-productive channels where venture is sacrificed to security."

Getting this message across to the American people is, as Mr. Greenewalt suggests, the main problem. When the government tells the people that "business" is bad, that profits are exorbitant and should be "shared," that the government will never let them be buffeted by the heartless, economic forces (that, incidentally, have built this country), it is difficult to tell the true story of what government policies are doing to the people's future.

If each voter were required to read and think about the message contained in "The Essential Element," I am sure he'd be less likely to continue the give-aways that are really take-aways.

FRED CROMWELL
Philadelphia, Pa.

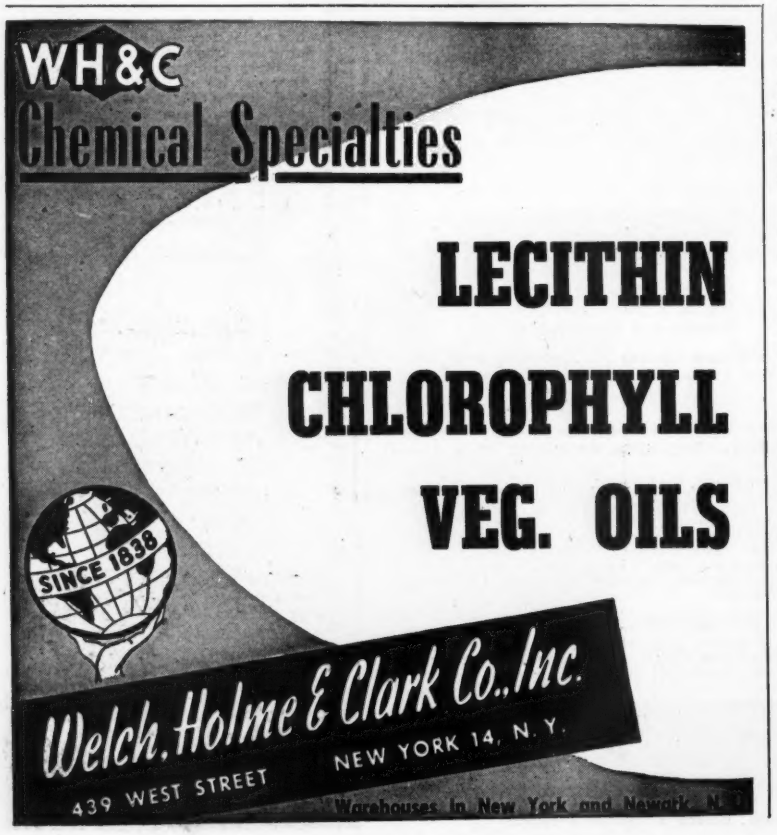
Steel Fact-Finding Board Missed An Opportunity

To the Editor of Chemical Industries:

All of the published summaries of the report of the Presidential Fact-Finding Board in the C. I. O.-steel industry controversy we have seen merely emphasize the Board's rejection of the union's bid for increased wage rates and its recommendation for a noncontributory social insurance and pension plan. The controversy continues and will continue doubtless as to whether this is a sound recommendation. For to accept that kind of social philosophy in its entirety means that we must incidentally accept the theory of a regimented and incompetent citizenry, who in the end can only become wards of a paternalistic government, or bluntly, slaves of a superstate. We have far more to fear from acceptance of such a philosophy than from outside communistic influence.

There is a good deal of common-sense reasoning in the Board's report, but it seems to have missed a grand opportunity to drive home some fundamental principles in the real meaning of social security. It could have been stated in simple straightforward language that there can be no social security or pensions for old age unless *everyone* is willing to make some present sacrifices to that end. There can be no economic justification for a 10¢ per hour expenditure by the steel companies for social security and pensions unless the workers are willing to contribute that much in extra effort toward increasing production, thus stabilizing the economy of the country as a whole. Social insurance and pensions will never be *adequate* unless the dollar has a stable value and the economy of the country as a whole is sound. The steel industry's executives believe that the workers would better appreciate this if they were also to contribute.

NATHAN C. ROCKWOOD
Chicago, Ill.



Mutual's SODIUM BICHROMATE

OTHER NAMES: Sodium Dichromate, Bichromate of Soda

FORMULA: $Na_2Cr_2O_7.2H_2O$

MOLECULAR WEIGHT: 298.05

DESCRIPTION: Deliquescent, orange-red, prismatic crystals.

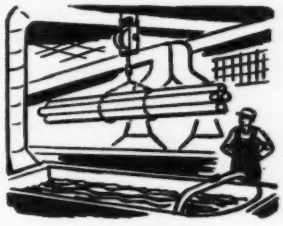
- Bulk Density averages 96 lb. per cu. ft.
- $Na_2Cr_2O_7.2H_2O$ 99.8% min.
- Chloride as Cl 0.06% max.
- Sulfate as SO_4 0.20% max.

USES: Chrome tanning of hides to produce durable, flexible leather. Yellow, orange and green pigment manufacture. Corrosion control in water and brine systems, drilling muds, petroleum pipe lines, etc. Surface treatment of metals to improve corrosion resistance, surface finish or paint adherence. Mordanting and oxidation of dyes for textiles. Photography, bleaching and purification of fats, chemical oxidation, wood preservation and others.

SHIPPING CONTAINERS: Bags—100 lb. net
Fibre Drums — about 400 lb.

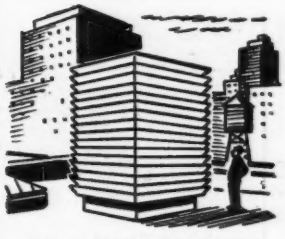
SODIUM BICHROMATE SOLUTION

TANNING



METALS

PIGMENTS



AIR CONDITIONING

TEXTILES

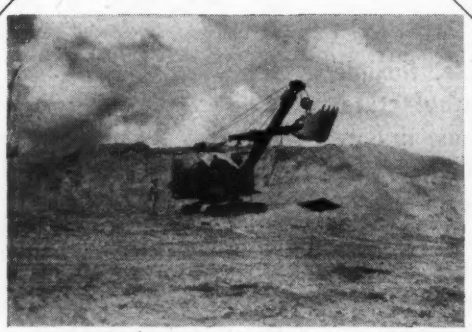
MUTUAL CHEMICAL COMPANY OF AMERICA

270 MADISON AVENUE ● NEW YORK 16, N. Y.

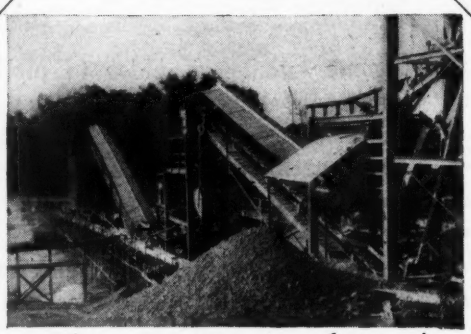
Life ...on the

QUALITY CONTROL of many of Cyanamid's products begins at the source of the raw material—in this case, bauxite, mined at Cyanamid's recently developed Berbice properties in British Guiana. Development of Berbice involved actual clearing of jungle tracts and building of all units necessary to operate the mine and house its 200-odd employees. This operation provides an important new source of bauxite for Cyanamid's Sulfate of Alumina, an important chemical in paper-making, waterworks and sewage treatment, leather tanning, dyeing, ink-making and soap manufacturing.

clearing the land for the Berbice mine

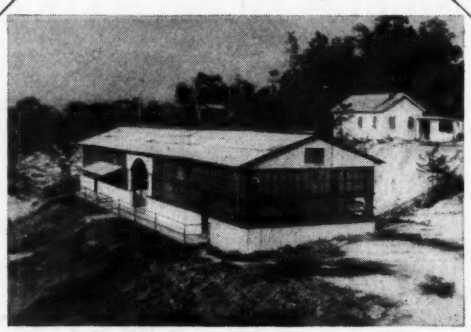


view of open-pit mine showing power shovel in operation



the processing plant (washer) located at Berbice

loading the barges with bauxite for transport downriver

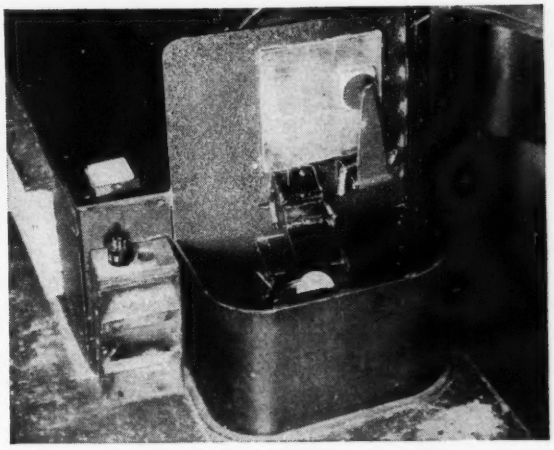


view of administration building located at the mine

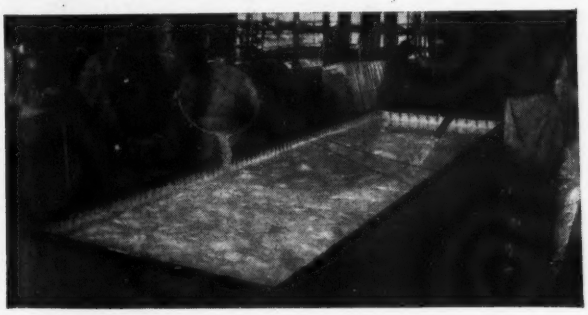
Chemical Newsfront

Courtesy Modern Packaging

WET-STRENGTH PAPER BANDS for celery retain their color and remain sealed throughout a cold-bath sterilizing process where they are drenched with thousands of gallons of ice-water. Cyanamid's PAREZ® RESIN 607 is the outstanding agent for imparting wet-strength to many types of paper for use in hundreds of different products.



THE "COMPENSATED OPAL." In color comparisons made with a spectrophotometer, white opal glass is sometimes used as a secondary standard of whiteness in place of the more fragile and easily contaminated sample of magnesium oxide which is accepted as the "standard." However, the use of opal glass requires certain calculations to compensate for the differences in whiteness. In Cyanamid's laboratories, it was found that by combining opal glass with a compensating clear glass, a correction to the desired whiteness was achieved, thus eliminating the time consuming calculations. Photo above shows this "compensated" opal in place in a standard spectrophotometer.



NEW RUBBER PLASTICIZER, Cyanamid's PEPTON® 22 is unique in that it can be added to the latex at the plantation, as in the above scene in Malaya, thus saving an extra step in adding the PEPTON 22 plasticizer to the rubber on the mill. PEPTON 22 cuts breakdown time at least 50% and considerably improves the processing qualities of rubber. Full details are available on request.

American Cyanamid Company
Industrial Chemicals Division
30 Rockefeller Plaza, New York 20, N. Y.

Please send literature or further data on the products checked:

- ☐ PEPTON 22 Plasticizer
- ☐ PAREZ Resin 607 for wet-strength paper
- ☐ Catalog: "Products and Services of American Cyanamid Co. for Industry and Agriculture—Second Edition"

Name .....

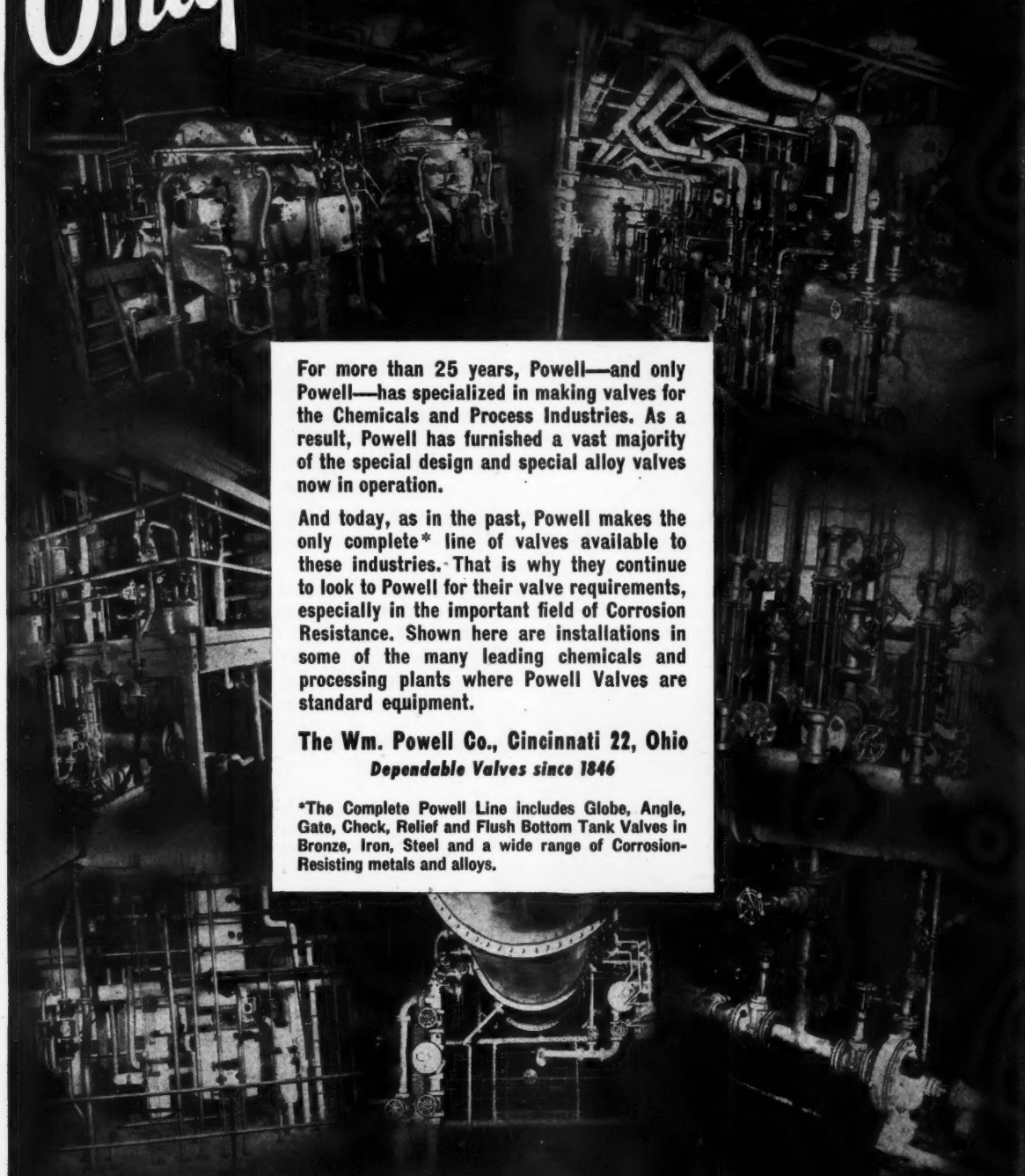
Company .....

Address .....

C. I. 11-49

AMERICAN Cyanamid COMPANY
30 ROCKEFELLER PLAZA · NEW YORK 20, N. Y.

Only POWELL makes valves of



For more than 25 years, Powell—and only Powell—has specialized in making valves for the Chemicals and Process Industries. As a result, Powell has furnished a vast majority of the special design and special alloy valves now in operation.

And today, as in the past, Powell makes the only complete* line of valves available to these industries. That is why they continue to look to Powell for their valve requirements, especially in the important field of Corrosion Resistance. Shown here are installations in some of the many leading chemicals and processing plants where Powell Valves are standard equipment.

The Wm. Powell Co., Cincinnati 22, Ohio

Dependable Valves since 1846

*The Complete Powell Line includes Globe, Angle, Gate, Check, Relief and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-Resisting metals and alloys.

POWELL

ALL the materials needed in the Chemicals and Process Industries

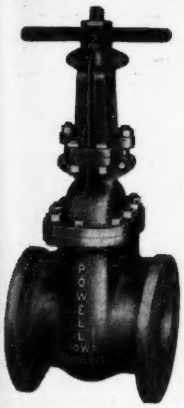


Fig. 2453-G—Large 150-pound Stainless Steel O. S. & Y Gate Valve.

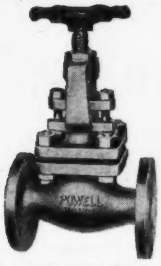


Fig. 1969-M—150-pound Monel Metal* O. S. & Y Gate Valve.

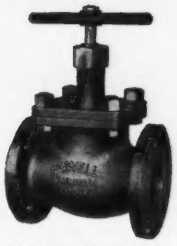


Fig. 1854—100-pound Aluminum Globe Valve with composition disc.

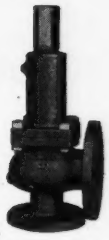


Fig. 2327 — Stainless Steel Angle Relief Valve with enclosed spring.

Fig. 1891 — Flanged End Liquid Level Gauge. Offset Pattern.

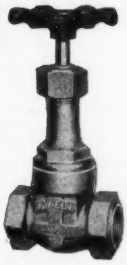


Fig. 1832-AMP—200-pound Ampco‡ Gate Valve.

THESE ARE A FEW OF THE MANY POWELL VALVES YOU WILL SEE AT OUR

BOOTH 54

22nd Exposition of Chemical Industries
Grand Central Palace, New York City
November 28 to December 3

Flush Bottom Tank Valve. Available in two designs. Fig. 2309—disc rises into tank to open; Fig. 2310—disc lowers into body.

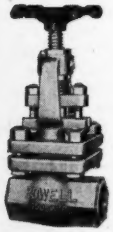


Fig. 1978-NI—150-pound Nickel O. S. & Y Globe Valve

Bellows Sealed "Y" Valve. Designed for high vacuum service and for installations where packing is unsatisfactory or fails frequently.

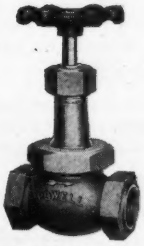


Fig. 1861-IN—150-pound Inconel* Globe Valve.

Fig. 2097—Stainless Steel Glass Sight Feed.

Fig. 1893— 125-pound Nickel-Iron O. S. & Y. Gate Valve with trim specially adapted for Paper Mill service.

Fig. 1845—200-pound Nickel Swing Check Valve.

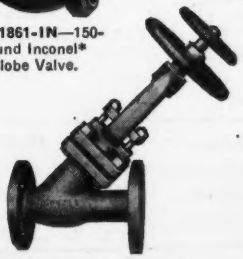


Fig. 2051 S. W.—150-pound Stainless Steel "Y" Valve with Powell Patented Seat Wiper.

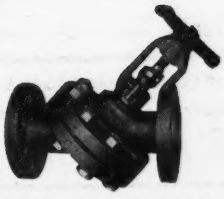


Fig. 1095 HA—300-pound Hastelloy† Separable Body, Reversible Seat "Y" Valve.

POWELL VALVES for Corrosion Resistance are available in the following Metals and Alloys.

Stainless Alloys
18-8S
18-8S Mo.
18-8S Cb.
Misco "C"
Durimet 20
11.5-13.5% Cr. Iron
18% Cr. Iron
28% Cr. Iron
25% Cr. 12% Ni.

Nickel and Nickel Alloys
Nickel
Monel Metal*
Inconel*
Hastelloy Alloys† (A, B, C and D)
Illium
D-10

Bronzes—Acid, Aluminum, Silicon
Everdur
Herculoy
Ampco‡
Ampcoloy‡
76
90-10
88-10-2

Alloy Steels
Carbon Steel
4-6% Cr. .5% Mo.
3½% Nickel Steel
6-8% Cr. Mo.
8-10% Cr. Mo.

Cast Irons
Cast Iron
3% Nickel Iron
Ni-resist*

Aluminum
Alcoa No. 43
Alcoa No. B-214
Alcoa No. 61 S-T

Silver

Hard Lead

Molybdenum

*Registered trade names of the International Nickel Co., Inc.
†Registered trade-name of the Haynes-Stellite Co.
‡Registered trade-name of Ampco Metal, Inc.

VALVES

by Dr. M. R. McCorkle, Use Research and Development Laboratory, Armour and Company

Fat-Derived Surface-Active Agents

Polyethylene glycol derivatives of fatty amines, fatty amides and fatty acids are available in commercial quantities from the Armour Chemical Division under the trade names Ethomeens, Ethomids and Ethofats.

Ethomeens are tertiary amines having one fatty alkyl group and two polyoxyethylene groups substituted on amino nitrogen:

$$R\text{-}N\begin{matrix}(CH_2CH_2O)_xH\\(CH_2CH_2O)_yH\end{matrix}$$

Ethomids are polyoxyethylene glycol substituted fatty amides having the general formula:

$$RC\text{-}N\begin{matrix}(CH_2CH_2O)_yH\\(CH_2CH_2O)_xH\end{matrix}$$

Ethofats are polyoxyethylene glycol esters of fatty acids having the general formula:

$$RC\text{-}O\ (CH_2CH_2O)_xH$$

The Ethomeens, Ethomids and Ethofats are supplied with fatty chains of from 12 to 18 carbon atoms with polyethylene glycol chains of 220, 440, 660 and 2200 molecular weights.

General Properties

The Ethomeens, Ethomids and Ethofats are all surface active agents. The Ethomeens are predominately nonionic but exhibit mild cationic properties because they are tertiary amines. This cationic activity is more pronounced in the Ethomeen salts formed by neutralizing Ethomeens with acids. The Ethomids and Ethofats are nonionic. The materials are supplied as salt-free 100% active products. They vary from fluid liquids to soft pastes depending upon length and saturation of the fatty chain and the relative proportion of the polyethylene glycol residue. The latter structural characteristics also control the solubilities of Ethomeens, Ethomids and Ethofats. As the relative proportion of the polyethylene glycol residue increases, the products become more water soluble and correspondingly less soluble in non polar organic compounds. However, all these derivatives are water soluble or water dispersible. The more hydrophilic derivatives can be dissolved in non polar solvents by the use of coupling agents such as isopropanol, fatty acids, etc.

Chemical Properties

Ethofats are resistant to hydrolysis and, therefore, stable to mildly acid and alkaline conditions. Ethomids are even more stable showing little, if any, hydrolysis in strongly acid or alkaline media. Ethomeens, being tertiary amines, are extremely stable in strong acids or alkalis. They react with acids to form substituted ammonium salts and with alkyl halides to form quaternary ammonium compounds. The hydroxyl group on the polyethylene glycol residue can be acylated under suitable conditions. Ethomeens, Ethomids and Ethofats are unaffected by calcium, magnesium or other hard water ions. They are compatible with most all types of surface-active agents. These materials exhibit strong solvent action for a variety of organic compounds. They are also heat stable.

Suggested Applications

Formulation of low sudsing liquid or dry detergents for laundry, dish-washing, dairy and food plant equipment; scouring and cleaning of cotton and synthetic fibers; dry cleaning soaps; fruit and vegetable washes, furs . . .

Preparation of solvent and emulsion degreasers, buffing compounds, metal cleaners, polishes, waxes, auto cleaners, rug and upholstery shampoos . . .

Soaping prints and chenilles, leveling basic dyes, sulfur, vat and direct colors, rewetting, finishing, wool oiling, stripping vat and sulfur colors, softening cotton wool, leather and paper . . .

Shampoos, hair creams, lotions, waterless hand creams, hair dyes, permanent wave formulations, shaving creams, deodorant creams . . .

De-inking, softening, rewetting and coating paper . . .

Pigment dispersing, emulsification of water base paints and inks, emulsion polymerization, paint and rust removers, insecticides, herbicides, chemical intermediates.

Write today for free bulletin, "The Ethomeens, Ethomids and Ethofats," containing technical information and suggestions for use.

ARMOUR *Chemical Division*

Armour and Company
1355 West 31st Street, Chicago 9, Illinois
120 Broadway, New York 5, New York

Composition of Etho-Chemicals

LINKAGE	Molecular Weight of Polyethylene Glycol Additions				Fatty Alkyl Groups Present									
	Molecular Weight 220	Molecular Weight 440	Molecular Weight 660	Molecular Weight 2200	Caprylic	Caprie	Laurie	Myristic	Palmitic	Stearic	Oleic	Linoleic	Linolenic	Rosin Acids
$-N\begin{matrix}(CH_2CH_2O)_xH\\(CH_2CH_2O)_yH\end{matrix}$	Ethomeen C/15	Ethomeen C/20	Ethomeen C/25	Ethomeen C/60	8	9	47	18	8	5	5	..	..	..
	Ethomeen T/15	Ethomeen T/20	Ethomeen T/25	Ethomeen T/60	..	..	..	..	25	30	45	..	..	..
	Ethomeen S/15	Ethomeen S/20	Ethomeen S/25	Ethomeen S/60	..	..	..	..	10	10	35	45	..	..
	Ethomeen 18/15	Ethomeen 18/20	Ethomeen 18/25	Ethomeen 18/60	..	..	..	..	6	93	1	..	..	..
$-CN\begin{matrix}(CH_2CH_2O)_yH\\(CH_2CH_2O)_xH\end{matrix}$	Ethomid HT/15	Ethomid HT/20	Ethomid HT/25	Ethomid HT/60	..	..	..	..	25	70	5	..	..	..
	Ethomid C/15	Ethomid C/20	Ethomid C/25	Ethomid C/60	8	9	47	18	8	5	5	..	..	..
	Ethomid RO/15	Ethomid RO/20	Ethomid RO/25	Ethomid RO/60	..	..	..	..	..	20	60	20	..	..
$-C-O\ (CH_2CH_2O)_xH$	Ethofat 242/15	Ethofat 242/20	Ethofat 242/25	Ethofat 242/60	..	..	..	..	..	..	15	15	..	70
	Ethofat 142/15	Ethofat 142/20	Ethofat 142/25	Ethofat 142/60	..	..	..	..	..	..	50	40	4	6
	Ethofat C/15	Ethofat C/20	Ethofat C/25	Ethofat C/60	8	9	47	18	8	5	5	..	..	..
	Ethofat 60/15	Ethofat 60/20	Ethofat 60/25	Ethofat 60/60	..	..	..	..	22	75	3	..	..	..

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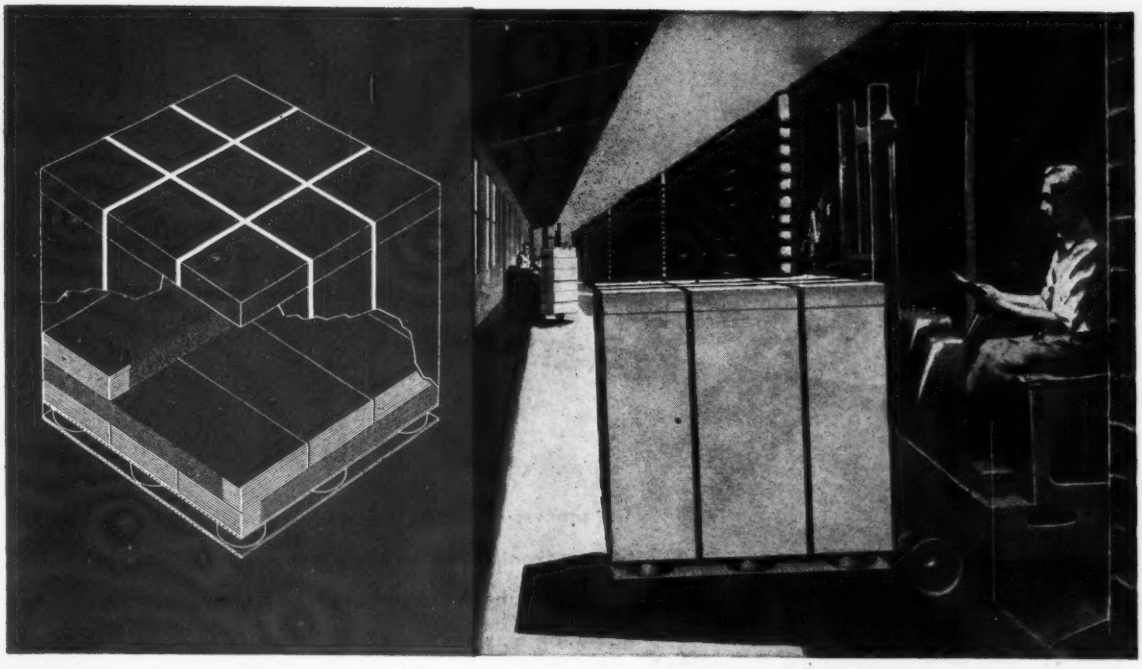

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will show you how to make Handling Labor more productive

ONE of the hidden costs in packaging is in the handling of packaging materials from unloading dock to warehouse to packaging assembly line.

Thanks to new ways of shipping and handling, many firms now find savings in handling costs alone more than justify a switch to Union Multiwall Bags. The Union Multiwall Specialist who calls on you, can tell you all about the recent cost-cutting developments in handling of multiwall bags.

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TRADE MARK UNION

SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region

*MINING

The process of mining sulphur, as developed by Herman Frasch, takes advantage of the fairly low melting point of sulphur (about 240° Fahrenheit). The process resolves itself into three parts: one, operating a power plant that heats and pumps to the field large quantities of water; two, distributing the hot water through wells to melt the underground sulphur, and raising the melted sulphur to the surface; three, cooling and solidifying the sulphur in large vats from which it is broken and loaded into cars for shipment.

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Loading operations at one of the huge vats of Sulphur at our Newgulf, Texas mine. Such mountains of Sulphur are constantly being built at our mines, from which shipments are continually made.

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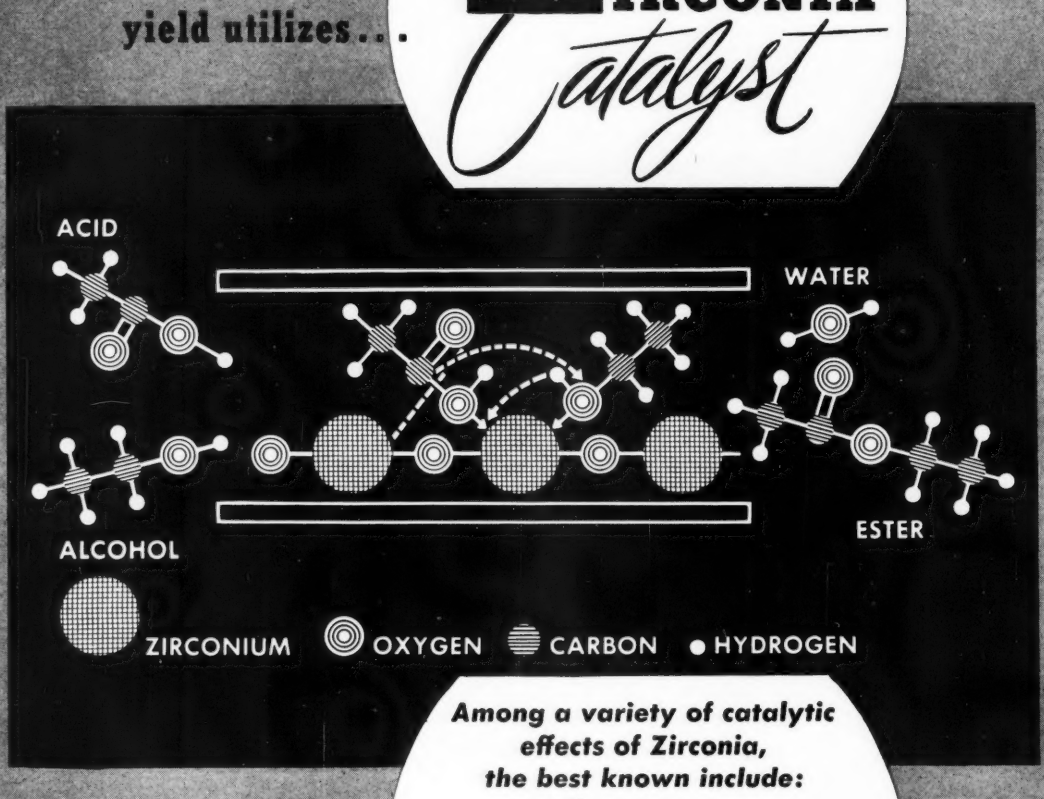
ZIRCONIA *Catalyst*



Research results show that Zirconia catalysts are effective in speeding many organic reactions. High yields of important commercial chemicals can be realized through their use. Zirconia is an extremely stable material and can be recovered quantitatively from a reactive system in which it is employed. It is non-toxic. In many ways, it is an ideal catalytic substance for processes yielding products that require high purity.

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THE PRODUCTION OF BUTADIENE

THE CRACKING OF HYDROCARBONS

THE CONDENSATION OF CERTAIN ORGANIC ACIDS

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U.S.I. CHEMICAL NEWS

November ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1949

New U.S.I. Chemical, Diphenyl Carbonate, Available for Research

An announcement has recently been made by U.S.I. that diphenyl carbonate is now available in research quantities. The chemical is a white granular solid at room temperatures and when crystallized from alcohol or acetone it occurs as needle-shaped crystals. It has a phenolic odor.

Diphenyl carbonate is soluble in hot alcohol, ether, benzene, carbon tetrachloride, acetone, glacial acetic acid, and other organic solvents. It is insoluble in water. It is hydrolyzed by hot alkalis and readily undergoes hydrolysis and ammonolysis. It has a density of 1.0997 as a liquid (111°C) and 1.272 as a solid (14°C).

It is available in 99+% purity.

Carbon Black Being Tried Out As a Soil "Heater"

Addition of carbon black to soil as a means of increasing soil temperatures and thereby extending the growing season is the subject of research at several agricultural schools throughout the country, according to a recent report. The report goes on to say that the initial tests indicated that carbon black, mixed into soil to a depth of two inches raises the average soil temperature at the surface and two inches down. This is because the carbon black, in the concentrations used, darkens the soil, increasing heat absorption. In the tests, the chemical was applied at the rate of 4000 pounds to the acre, though it was stated that application at half this rate has been found effective.

There is no evidence, according to the report, to indicate that carbon black is a plant nutrient, is digested by plant roots, or has any other direct effect on plants. Whatever influence it exerts on plant growth is attributed to its effects on soil temperatures, as well as on the texture, salt-retention, and moisture-retention of soils.

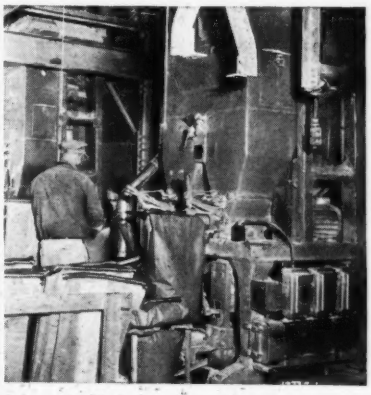
Stable Graphite Film Has Novel Lubrication Uses

A successful means of applying a stable graphite film to practically any surface is said to have been developed recently. The film, as applied by the new process, is extremely thin (0.00015 to 0.0005 inch) but is claimed to have excellent resistance to abrasion and exceptional bearing strength. The adhesion to the intended surface is high and, it is pointed out, on metal and most other surfaces sufficient diffusion of the graphite into the surface is obtained to ensure presence of a graphite surface even when the external coating is apparently removed. Application is described as being by spray or dip, following normal surface preparation, and is followed by baking at temperatures of 300° to 400° for a curing cycle of one hour maximum which achieves diffusion of the graphite into the base material. The new process is said to have been used successfully on metal, plastics, rubber, and ceramics.

Pyrenone-Treated Packages Seen Saving Millions in Food Damages

Insect-Resistant Multi-Wall Paper Bags Made By St. Regis Paper Co. Prove 100% Effective in Safeguarding Flour During Storage And Shipment—Other Developments Foreseen

Insect-resistant paper bags which give flour in transit and in storage complete protection from insect infestation have just been announced by the St. Regis Paper Company. Newest, and one of the most important industrial uses yet found for U.S.I.'s non-toxic insecticide material, Pyrenone*, this development presages a whole new approach to the problem of preventing insect damage to packaged food products. The government estimates that such damage now costs the American public millions of dollars annually.



Completely automatic filling of multi-wall flour bags in a modern plant. Outstanding insect resistance is achieved when the outer wall of this type of bag is treated with U.S.I. Pyrenones.

U.S.I. reports that the St. Regis Paper Co., after three years of investigation devoted to technical problems and rigid testing, has made available multi-walled bags, with the outer surface of the outside wall treated with Pyrenone. These bags have been demon-

MORE

Color Photographs From Black and White Negatives

A new method of making high-quality color prints from black and white negatives has recently been demonstrated. It involves making a special black and white print and then staining this print with dyes.

The crux of this process is in the color-selective nature of the black and white print. This is obtained by making the print as a gelatin relief image of the original exposure. The thickness of the gelatin then determines how much color is absorbed.

It works this way: The original picture is taken much as any color photograph, observing the same range of lighting contrasts. The negative is then exposed by contact or projection onto a special stripping film, which when processed by baths forms the gelatin relief image. In the final steps, the silver is bleached out of this film and is replaced with a black dye.

When a color is applied it acts on the black dye as a cutting reducer, replacing it in proportion to the thickness of the gelatin. All the various tones and shades of any particular color area are obtained with a single sweep of the brush. Colors are automatically modified with black and white to simulate light and shade, while highlights and white area accept no color and remain clear. Color corrections can be made by simply applying the correct color over the undesired color.

Separates Fatty Acids By New Process

A new method that makes it possible to segregate almost completely the high-melting and low-melting fatty acids of a fat into separate ester fractions has been described recently. Directed interesterification, in which ester-ester interchange is carried out in triglyceride mixtures with simultaneous crystallization of solid glycerides, was applied to glyceride mixtures containing free hydroxyl groups. Solid saturated diglycerides and saturated monoglycerides were precipitated from cottonseed oil.

Helpful Information For Adhesive Users

A new pamphlet entitled "How to Prepare and Use Glues, Pastes, and Gums" has recently been made available for distribution. It contains data on storage and handling of all types of adhesives.

Urethan Effective In Multiple Myeloma

Four patients suffering from multiple myeloma underwent urethan therapy which resulted in striking improvements in all aspects of this condition, it has been reported. A total of 120 to 290 grams of urethan was administered orally in governed doses over an 8 to 10 week period and the patients were observed over a 7 to 13 month period following. Physiological symptoms subsided (and the blood picture improved greatly) after 2 to 4 weeks of this treatment. There was no evidence of skeletal recalcification 4 to 6 months after treatment, however. It was stated that although urethan treatment looks promising at this time, further work is needed to determine the extent of repair of the bone tissue and long term results of this type of therapy.

CONTINUED

Treated Packages

strated to be practically impervious to insect penetration even under exceptionally severe conditions. Availability of flour packed in insect-proof bags already has been announced by one of the large milling companies.

St. Regis representatives advised that while untreated kraft multi-wall bags are fully satisfactory for flour shipments under normally favorable conditions, the treated bags were developed to meet extreme conditions where weather or other circumstances favor rapid breeding and heavy infestations.

Severe Field Tests

Full protection under unusually abnormal circumstances was demonstrated first by severe tests conducted under the supervision of the American Institute of Baking and the Institute of Paper Chemistry, and later confirmed by trial commercial shipments of flour.

In a recent and dramatically severe test, a new freight car loaded with 900 bags of flour, packed in Pyrenone-treated bags, was deliberately infested with 4,000 red rust beetles, one of the more destructive of the insects attacking grain and flour. The car was then sealed and shipped from a flour mill in Enid, Okla., to a bakery chain in Memphis.

At the termination of the trip after 70 hours in transit, investigators found that every bag had survived the journey intact and unpenetrated. They found 2,361 of the beetles dead and the remainder either paralyzed or moribund. This result was regarded as having given the flour 100 per cent protection.

A second test commercial shipment of flour in multi-wall paper bags treated with Pyrenone was even more stringent, but equally successful. In this case, 3,000 live confused flour beetles were scattered over 990 multi-wall flour bags, and fifteen days elapsed before the car was opened and inspected. The count showed 2,622 dead beetles, 41 in a coma and 3 paralyzed. In addition, 28 dead larvae were found. No insects of any kind penetrated the treated outer wall of the bag.

Food losses due to insect penetration of packed flour, cereals and other products present a major economic problem, and insect-resistant packages of all types long have been a goal of manufacturers. Pyrenone materials, which combine freedom from toxicological hazards with effectiveness against most if not all insect invaders, have permitted progress not heretofore possible in reaching that objective.

The St. Regis company has other developments underway leading toward the protection of other food products with Pyrenone-treated papers. Pyrenones are especially effective against most types of grain insects, including the hard-to-kill cadelle. Their effectiveness stems from the synergistic combination of a new chemical, piperonyl butoxide, with pyrethrins. Exhaustive tests have demonstrated the fact that Pyrenones are non-toxic to humans and animals.

Other investigations with Pyrenones are concerned with the treatment of kraft boards and cotton bags to make them insect-resistant. Recently an adhesive containing Pyrenone was made available for certain packaged food products.

*Pyrenone is a registered trade-mark of U.S.I. It designates combinations of Pyrethrins and Piperonyl Butoxide.

Alloy Cast Steel For Use at Minus 423° F.

Development of a new alloy steel capable of fulfilling extraordinary engineering requirements of sub-zero service at operating temperatures as low as −423° F. has been announced. An austenitic cast ferrous alloy containing chromium and nickel, among other alloying constituents, the alloy steel is believed to have particular usefulness for low-temperature applications in the oil, chemical, and other processing industries.

Amino Acid Requirements Seen Increasing with Age

Experimental work with rats has shown a greater requirement of the sulfur-containing amino acids by the adult rat than by the growing rat. This difference may be explained by the fact that different types of anabolic reactions occur in the adolescent than in the adult. These changing anabolic reactions have different requirements for various amino acids. It is said that possible species differences in amino acid requirements would be expected, not so much on the basis of differences in the nature of anabolic reactions, as on the basis of differences in reaction rates.

TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

For quick weighing in gravimetric analyses — without errors of reading, interpolation, and computation — a new direct-reading lab. balance is on the market. **(No. 508)**

A new solder gun, with a plastic housing, is said to be available for quick, radio-service type soldering. It is described as equipped with a small spotlight and having an extra tip for deep-chassis work. **(No. 509)**

A new paint remover, for spray application, is claimed to give nearly 100% removal of highly resistant paints. It is said to wash off easily and be non-corrosive, and is stable in storage for up to six months. **(No. 510)**

Adhesive strength greater than rivets is claimed for a new adhesive being used to bond brake linings to brake shoes. It is described as having twice the safety of rivets while doubling the brake's life. **(No. 511)**

New plastic sponges, said to have all the advantages of other sponges with none of the disadvantages, are claimed to be resistant to mild acids, alkalies, soaps, and washing compounds. They can be boiled, are velvet-soft when wet, and wipe dry like a chamois, according to the manufacturers. **(No. 512)**

Ammoniated lozenges and chewing gum, with added chlorophyll, have been developed which are said to be as effective as ammoniated dentifrices in releasing ammonium ions. **(No. 513)**

To combat eye, ear, nose and throat infections, a new sulfa drug is said to be superior in antibacterial activity. It is also claimed germs do not become resistant to it. **(No. 514)**

Easier car-starting at low temperatures — down to 20° below zero — is claimed for unique carburetor preheater. **(No. 515)**

Called "the successor to wax," a liquid plastic coating is available which reportedly forms a cellophane-like coating over varnished or painted surfaces, on either metal or wood. It is applied with a cloth, is quick drying, and forms a highly resistant and durable finish, the makers state. **(No. 516)**

Rubber products of any color are reportedly possible now with the development of an extremely fine-particle silica pigment which can be manufactured inexpensively and in quantity. **(No. 517)**

One-hand operation of wash bottles is possible now, it is reported, with new all-plastic wash bottles for lab use. A gentle squeeze of the bottle is said to eject a strong, easily controlled stream of fluid. **(No. 518)**

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Diethyl Oxalate
PHTHALIC ESTERS
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate
OTHER ESTERS
*Diatol
Diethyl Carbonate
Ethyl Chloroformate

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Acetoacet-ortho-anisidide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
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*Arofene—pure phenolics
*Arochem—modified types
Ester Gums—all types
Congo Gums—raw, fused & esterified
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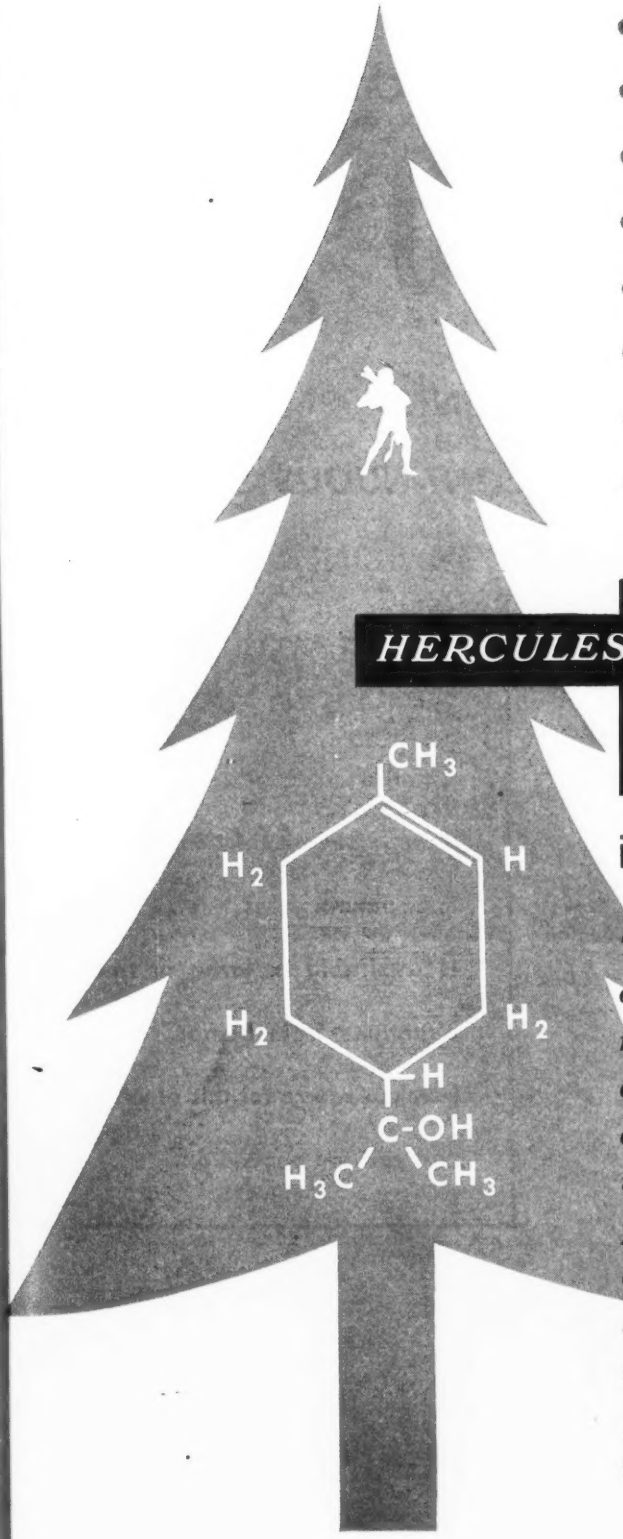

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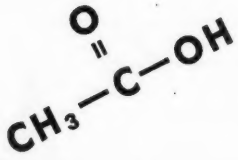

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Color	Water white
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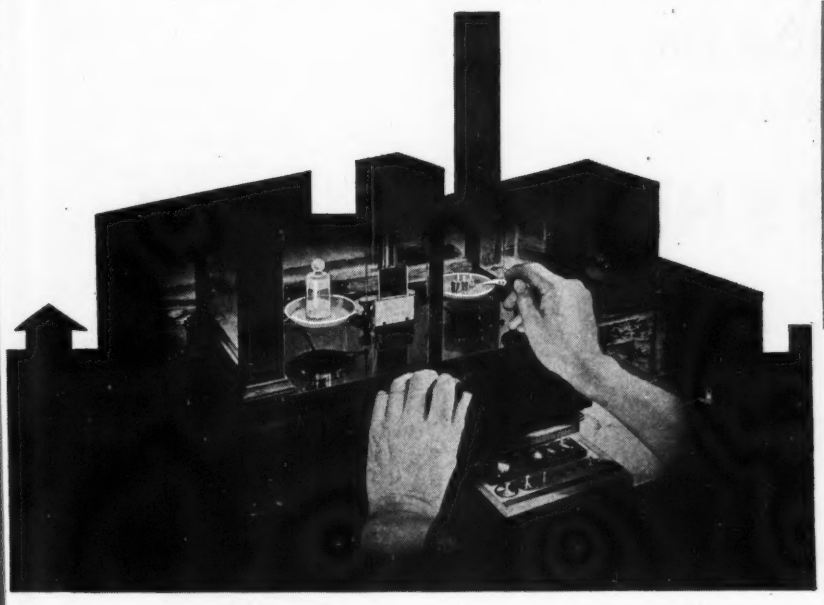

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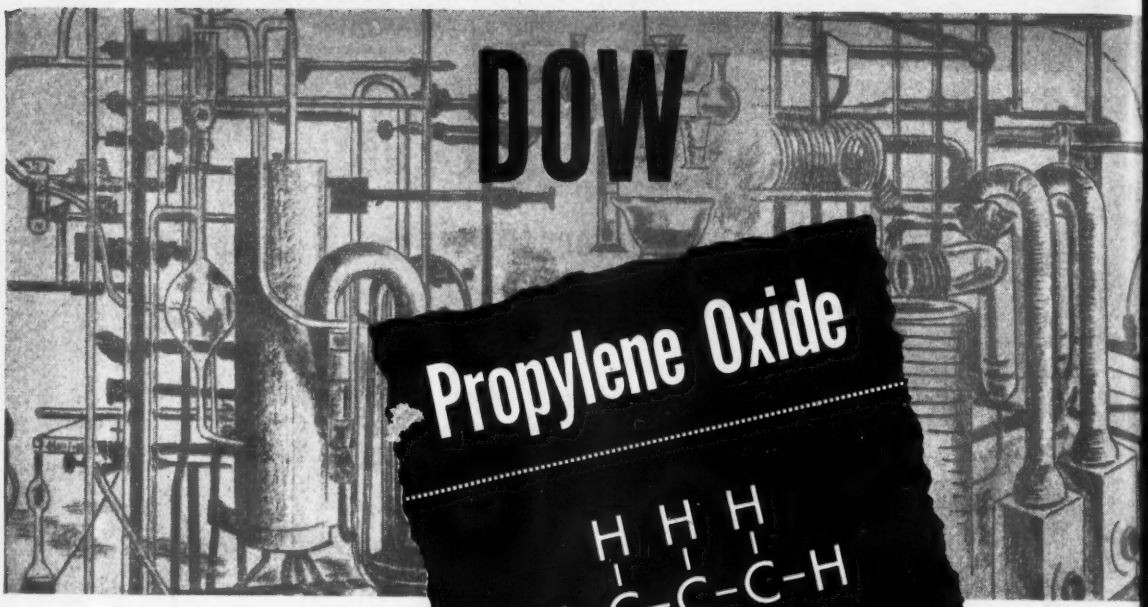
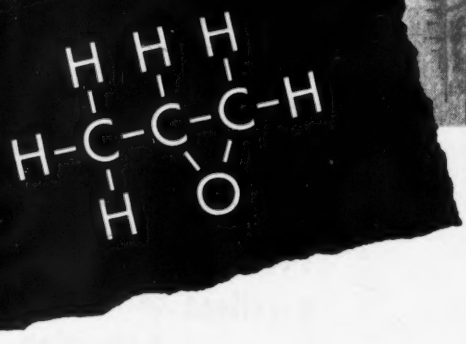


DOW

Propylene Oxide



PROPERTIES

Clear, colorless, volatile, flammable liquid.

Boiling range, 5-95%	34-35° C.
Specific gravity at 25/25° C.	0.826
Pounds per gallon at 25° C.	6.9
Freezing point	−112° C.
Flash point	below −20° F.
Fire point	below −20° F.
Refractive index at 25° C.	1.363
Viscosity at 25° C., centipoises	0.28
Viscosity at 0° C., centipoises	0.39

Propylene Oxide reacts with amines to form alkanolamines, with alcohols to form glycol ethers, with acids to form esters, and with phenols to form phenoxy alcohols.

In addition to the use of Propylene Oxide as an intermediate, it may be used as a low boiling solvent for cellulose acetate, nitrocellulose, vinyl resins, natural resins, hydrocarbons, and as a sterilizing agent or a product to inhibit the action of yeasts and molds.

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TO INDUSTRY AND AGRICULTURE

Chemical Industries

THE MAGAZINE OF THE CHEMICAL PROCESS INDUSTRIES

Newsletter,
November, 1949

For Your Information:

Pentaerythritol production on the West Coast will soon be a reality when Commercial Solvents Corp. completes its plant at Agnew, Calif. It already makes the raw materials, formaldehyde and acetaldehyde, at that location. Market in the eleven Western states is about a million and a quarter lbs. per year, of which CSC probably will be able to supply 10-15 per cent. Incidentally, CSC is also considering resumption of ethyl acetate production at Agnew.

Look for increased activity in acrylonitrile in the near future. American Cyanamid Co. is now the sole producer, but the burgeoning demand--by Du Pont for Orlon, by Carbide & Carbon for Dynel (formerly Vinyon N), Chemstrand Corp. for its new fiber, and New Jersey Standard for Perbunan rubber--makes expansion, or entry into the field by new producers, a likely bet.

* * CI * *

Some new Oronite Chemical Co. products should make news a few months hence: A commercial plant for the separation of meta and para xylenes will start operating about the first of the year. Oronite has been selling the mixture as a commercial xylol solvent, but this will be the first commercial production of the para isomer. (A logical end-use of para-xylene would appear to be oxidation to terephthalic acid, basis of Du Pont's Terylene fiber.)

Other new aromatics scheduled for early production are para-alkylphenols (octyl, decyl, tetradecyl), presently sold in mixed form but soon to be separated. Like Rohm & Haas' tertiary octylphenol and Indoil's nonylphenol (the highest alkylphenol heretofore available), they will be raw materials for detergents, emulsifiers, and lube additives.

* * CI * *

The second plant to recover sulfur from Wyoming sour gas (CI, Feb. 1949, p. 210) is scheduled to be put into operation this month at Worland, Wyo., by Texas Gulf Sulphur Co. Initial plants call for 125,000 tons annual sulfur output. A similar plant was completed earlier this year at Elk Basin, Wyo., by Stanolind Oil and Gas Co. The Elk Basin sulfur is now being stockpiled, and the hope is that it will eventually be used for local production of sulfuric acid, and the latter in turn

would be used for local manufacture of superphosphate fertilizer from Western phosphate rock.

Expanded production has permitted General Mills to reduce prices of allyl starch solutions to a point competitive with shellac, with the result that the material is now replacing shellac in certain adhesives. It is also going into aniline inks, where it offers advantages for printing on glassine and cellophane.

* * CI * *

Griffin Chemical Co., San Francisco, has under development a herbicide paste concentrate, a half-and-half mixture of air-milled pentachlorophenol and emulsifier. The paste can be mixed with any oil or petroleum fraction at hand to make a stable herbicide emulsion spray containing about 1 per cent penta.

A flotation process for de-inking newsprint has been developed by Denver Equipment Co. The pilot-plant phase has been completed, and the first commercial installation is about to begin operation. Chief advantage claimed: a much whiter product.

* * CI * *

British Patent No. 619,014 to N. V. de Bataafsche Petroleum Maatschappij, a principal member of the Shell group, points a way to allyl alcohol without use of chlorine. Unsaturated alcohols (allyl or methallyl) are produced by reacting a saturated non-tertiary alcohol (ethanol or isopropanol) with an unsaturated, non-aromatic aldehyde (acrolein or methacrolein) over a catalyst having hydrogenating-dehydrogenating activity (oxides of Group II metals). The starting alcohol is converted to the corresponding aldehyde or ketone.

* * CI * *

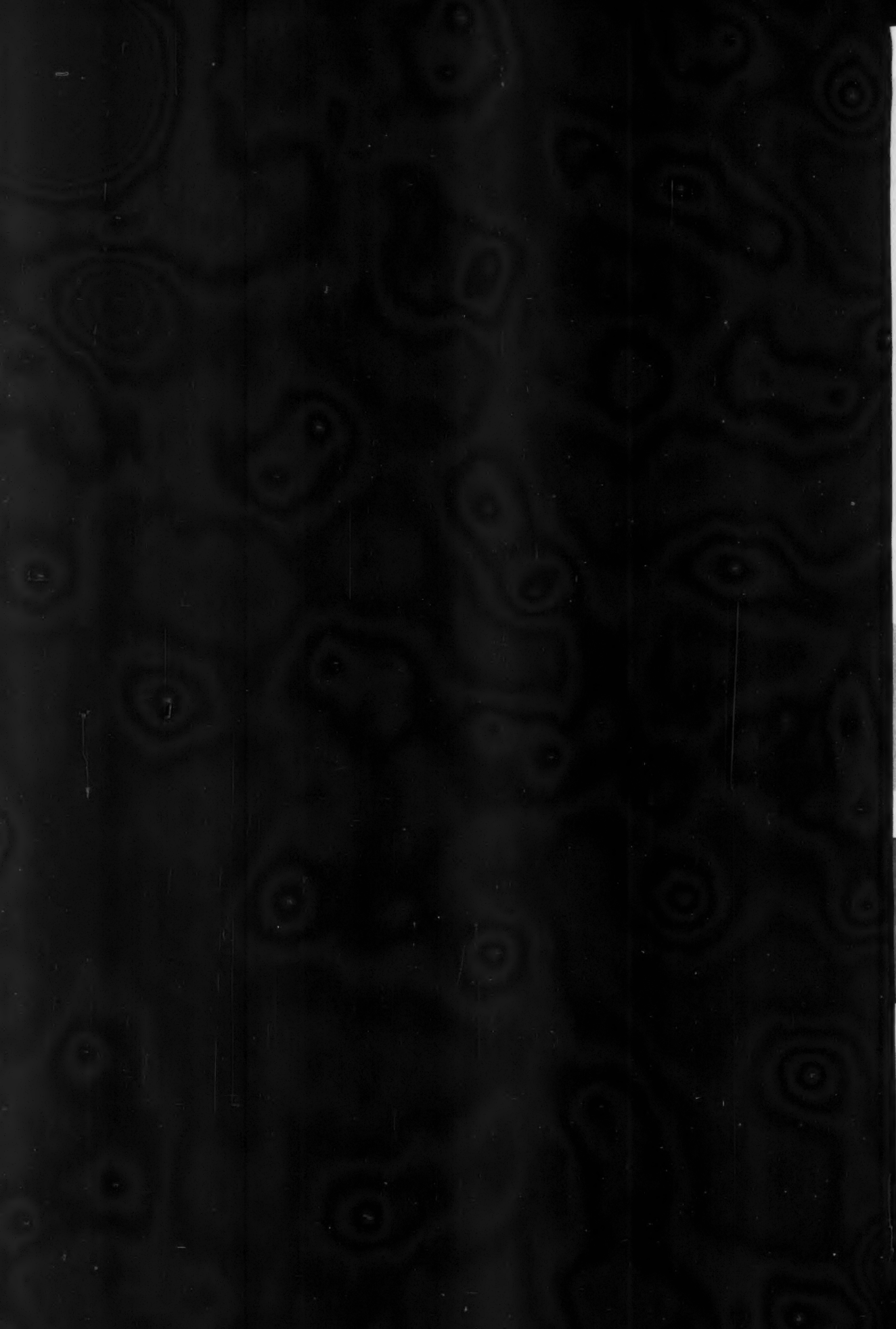
Here and There:

Hercules Powder Co., major naval stores producer, will construct a pilot plant at Klamath Falls, Ore., to study extraction of chemicals from Western woods...Antros A-B, a Swedish firm, will set up facilities in this country within a couple of months to manufacture an anti-corrosive paint now used by the Swedish Navy and various Scandinavian industries.

A new gas field in Texas has been brought in by Brazos Oil and Gas Co., a Dow subsidiary...Valve Engineering and Development Co. has perfected a device that eliminates as much as 96 per cent of surge or shock pressures (e.g., "water hammer") in piping systems...Monsanto Chemical Co. has installed an additional 55 tons per day of chlorine capacity, which is believed to be the first installation outside of Hooker Electrochemical Co. of the new "jumbo-size", 20,000-amp. Hooker cells.

Monsanto Chemical Co. will build a resin adhesives plant on an eight-acre tract at Santa Clara, Calif....Nassau Chemicals, Inc., is now producing rutin in its Sebastopol, Calif., plant. The firm is also readying a complete line of household specialties for the Western market.

The Editors



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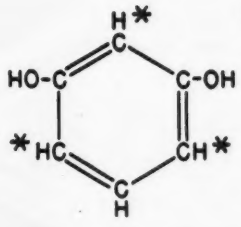

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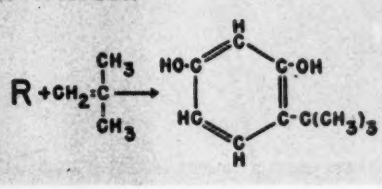

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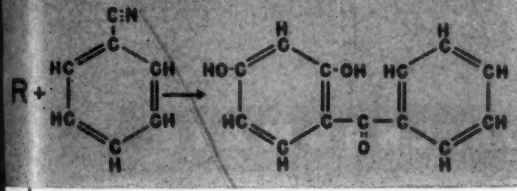

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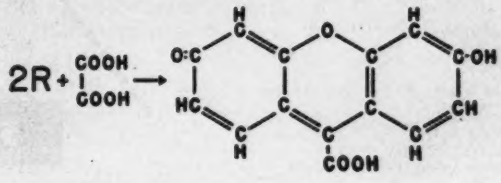

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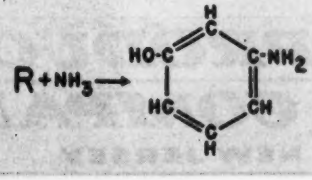

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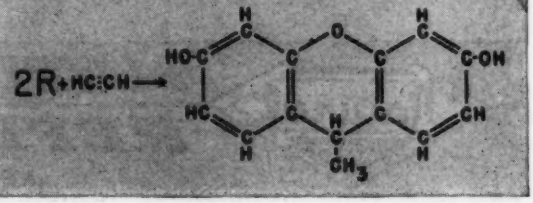

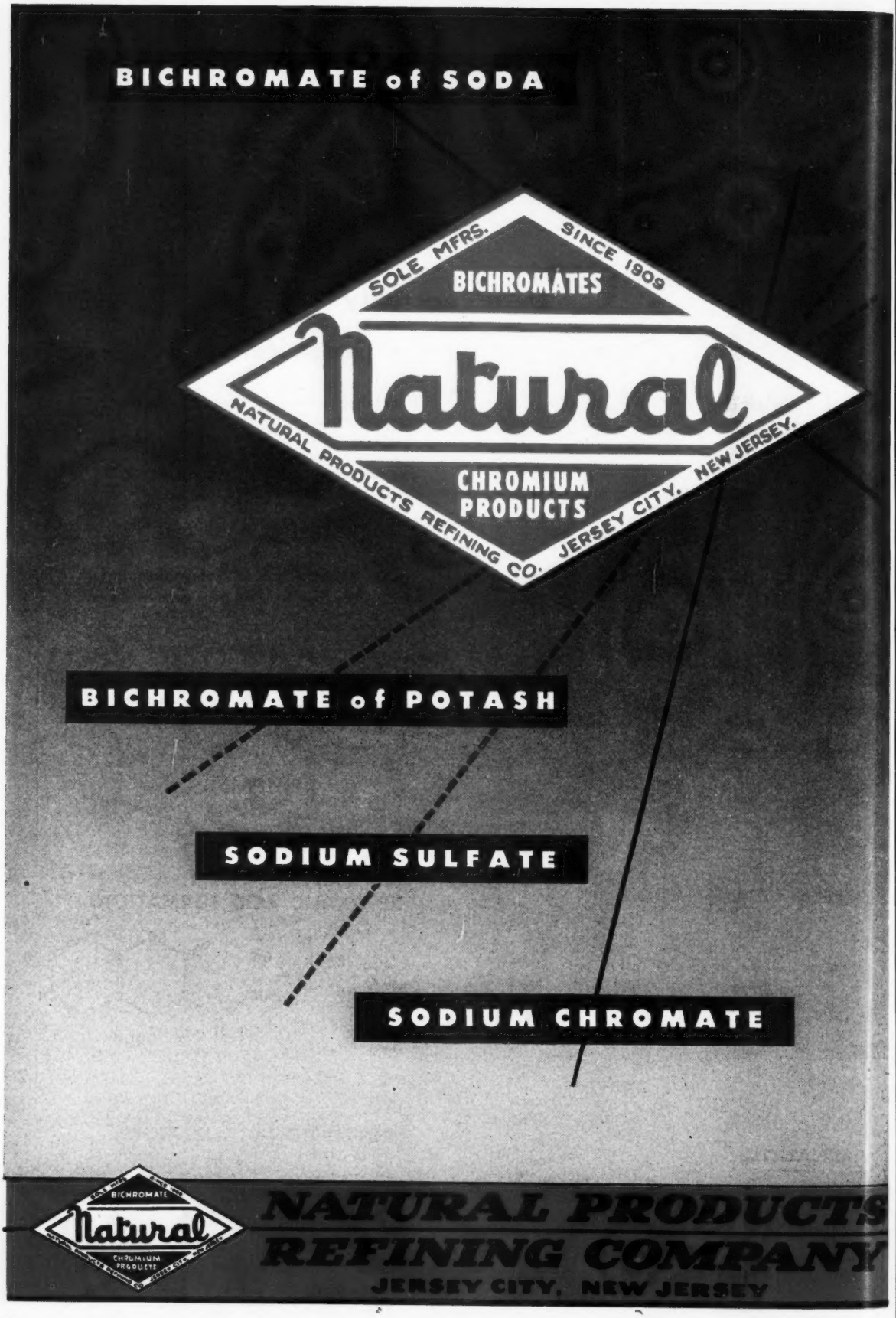
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FDA HEARINGS OFFER DUAL OPPORTUNITY

by ***ROBERT L. TAYLOR, Editor***

IN THE FORTHCOMING Food and Drug Administration hearings on pesticide residue tolerances, agricultural chemical makers have a golden opportunity to put an end to much of the criticism that has been levelled at some of their products.

It is unfortunate, to say the least, that certain newspapers have been able to find no more deserving subjects for their sensational and scare headlines than a material like DDT, which though still youthful, has been among mankind's hardest-working benefactors in both war and peace. The setting up of safe tolerances for this and other insecticides, fungicides, and plant growth regulants should go far to provide what is needed for effective deterrence to misuse of the materials themselves as well as distortion of information about their toxicities and other properties.

AT THE SAME TIME, however, the hearings provide in a broader sense a splendid public relations opportunity for manufacturers to reinforce in a sound and convincing fashion the public regard for chemicals and chemical industry generally.

It is a fact that chemical makers must constantly keep in mind that they are part of an industry which until recent years has not been particularly dependent on the direct support of the public. They have been once, twice or thrice removed from the ultimate consumers of their products. They have not had to take the public into their planning to any large degree.

The FDA hearings are indeed themselves one manifestation of the way this situation is changing. Chemicals which are recognizable as chemicals are daily entering into the living routine of Mr. and Mrs. America. And as natural products continue to give way to synthetics we believe it is no exaggeration to say that a relatively few years will see the names and many of the products of almost every major chemical company as commonly used words in the average American household.

So in the FDA hearings participating companies have an opportunity not only to correct a situation that needs correcting but also to impress upon legislators, customers and the public alike their sincere desire to assist and cooperate in every way possible in the establishment of safe standards of use for their products.

There are several ways in which this can be done.

Probably most obvious is through the presentation of testimony that is so well prepared and well documented that it immediately commands the respect of all who hear it. Sound information poorly presented is almost as bad as having poor information in the first place. Surely there is no quicker way to destroy confidence in a speaker and what he represents than for him to appear to be ill-informed or uninformed.

Almost as important is avoidance of all semblance of using the hearings to "sell" a product. Such attempts are always quite obvious and seldom reflect credit on anyone. While it may not be possible to avoid partisanship entirely, if the hearings are allowed to swerve from their main purpose of establishing permissible tolerances the whole effort could easily prove fruitless, with attendant discredit on the industry and prolongation of a situation that has already resulted in a slowing down of development and introduction of new agricultural chemicals.

A reasonableness, a willingness to consider the other fellow's views will also be a point of strength in establishing the industry's sincerity of purpose. Every evidence of a clear desire to tackle the problems of the hearings strictly from the standpoint of the public good will accrue to the overall credit of the participating bodies.

BY KEEPING SUCH CONSIDERATIONS in mind as evidence and testimony are prepared not only for this but for any public hearing, chemical producers can accomplish a great deal in building a sound reputation for public-spiritedness of their industry. The future progress of the chemical industry is going to be bound increasingly to the acceptance of and confidence in chemicals by the public generally. The time has come when the chemical industry must adopt the constant public consciousness of a consumer industry if it is to continue to progress at a maximum rate.

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What's new

EXPORTS RIDE FOR A FALL

Effects of European currency devaluation on chemical exports will be largely short-term. Increase in imports will be relatively small, but longer-lasting.

DEVALUATION of the British pound, which was closely followed by similar action in 27 other countries, has brought forth a rash of press comments—mostly on such consumer items as Scotch whiskey, British textiles and automobiles, and Swedish glassware.

While these are the items that capture popular imagination, the less publicized effect of these monetary shenanigans on industrial goods will prove more telling.

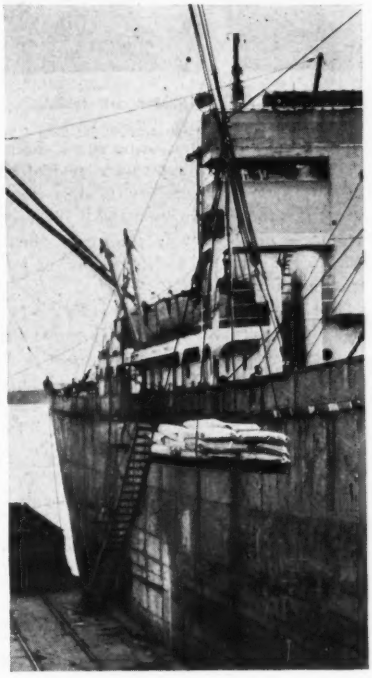
Most Exports Essential

In the case of many chemical commodities (certain pharmaceuticals, petroleum solvents, etc.) the American producer has been in the enviable position of being able to say, "Buy from me or go without." Where those conditions still exist exports will not be affected, even though the foreign purchaser will have to shell out more of his local currency. Scarcity of dollars rather than price levels will continue to put the ceiling on his purchases.

But where the devaluated country is in a position to compete for world markets, the American would-be exporter might just as well have stood in bed. England, for example, is making inroads on the U. S.'s former alkali market in Latin America; and many other commodities, like penicillin, are in the same boat. The full effect of devaluation has not yet shown up in the production departments, which are still working on previous commitments; but it is manifesting itself in a thinning of new orders.

Some process equipment manufacturers have already suffered a decline in foreign orders, but that state of affairs is by no means unexceptionable. Working against the benefits of devaluation is the inability of many foreign fabricators to guarantee reasonable delivery dates: two to three years, as promised by some British firms, is hardly reasonable. Another factor is American technology, which in many respects is so advanced that it can compete handily even against devaluated prices.

Also cushioning the effects of money-monkeying, of course, is the ECA subsidy of exports. Pressure of beneficiary countries on ECA to permit purchase from non-dollar areas will almost certainly be resisted by Congress when it reconvenes, particularly where domestic production is in the doldrums.



CHEMICALS FOR EXPORT: Fiscal finagling thins orders.

Lesson from History

Historically, it would appear that the effects of devaluation will gradually wear off. In the past such monetary measures have always been followed by inflation, and the resulting increase in prices and wages soon cancels out the temporary advantage conferred by devaluation. Some economists think that many countries should devaluate their currencies every few years in order to stay ahead of the game!

The consensus as far as exports are concerned, then, seems to be that the effect will be immediate but relatively short-lived although the chaotic state of world trade conditions—currency controls, import and export licenses, and all that—qualifies even that broad generalization.

Foreign Investment

A more lasting effect, thinks the sales manager of a large domestic chemical firm with foreign affiliates, will be added impetus to the trend toward collaborative investment in foreign plants.

A company with foreign plants is effectively hedged against fiscal finagling. Latin America, for example, until recently bought certain drugs from the States. Now it buys these pharmaceuticals from the firm's English affiliate. The same affiliate also just picked up a South African order for oil additives that the domestic firm lost on cancellation.

Putting money into foreign enterprises —one of the points of President Truman's Point 4 program—is a ticklish business at best: The threat of nationalization and restrictions on converting profits into dollars are effective deterrents to American investment.

But collaborative investment—where the American firm furnishes technical advice and continuing research results, and local investors in the foreign country put up at least a portion of the capital, the profits being divided equitably—offers a reasonably safe entry into profitable relationships abroad. It is a hedge, too, in that loss of export business at home usually means increased activity of the foreign affiliate.

Imports May Increase

Two factors—devaluation and lowered tariff duties—will tend to increase foreign competition for the American market. The effect of devaluation on individual commodities will not be general, for there are often particular circumstances that alter the picture. British creosote, for example, which is bought largely by coastal consumers, will presently sell for the same price as before, according to Bernuth, Lembcke Co. Britain would be happy to take a higher profit (in terms of the pound) on their present share of the business; for a price cut would be met by domestic producers and neither group would gain. Those considerations would apply generally to items that are now competitively priced, and also to such essential imports as rubber, waxes,

and botanicals, the sales of which would not be materially increased by a price cut.

But where foreign commodities have been too high-priced, devaluation will tend to make them competitive and give them a wedge to open American doors. Such is the case with pyridine, cresylic acid, naphthalene, and the like. Since large users have contracted for three or four months ahead, the effect is not yet apparent.

Many items carry such heavy tariff levies that devaluation will be ineffective. This is generally true of many fine chemicals such as dyes and pharmaceuticals.

New Patterns

All in all, it is generally conceded that devaluation, like all arbitrary monetary artifices, is only a palliative and not a cure for a nation's economic ills. But acting as a palliative, it may give the patient an easier time in which to recover his strength. Thus it my provide new and cordial buyer-seller relationships (with other than American sellers), create markets to sustain plant expansions and new enterprises, and establish new trade patterns. About the only consolation left to the American manufacturer is the dim hope of lower taxes when revival of foreign industry renders further ECA aid unnecessary.

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Paper disk controls flow of an automatic dispenser-titrator with reproducibility within 2%.

THE ANCIENT Greeks and Egyptians used to tell time by a vessel, called a clepsydra, into which water dropped at a constant rate: half full, time for lunch; three-quarters full, appointment with the Pharaoh.

This principle was reversed by Mott Cannon, during his biochemical researches at the University of Wisconsin, when he needed a mechanical superman to help him measure out large numbers of fluid samples for microbiological assays. As ultimately developed and refined, the machine replaces pipettes for measuring out definite liquid volumes, and burettes for titration of samples.

Several industrial and academic institutions are already using early, hand-built models; but now Cannon is building and selling them through the International Instrument Co., Los Angeles.

Dispensing

In dispensing, the instrument utilizes the principle that the volume of liquid delivered from an orifice is proportional to the length of time it is allowed to flow—

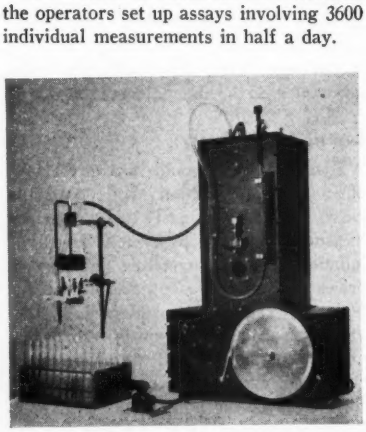
MOTT CANNON: Men are fallible.

other things, of course, being equal. Four units are involved: a pressure regulator, operating on a laboratory air-line, that keeps constant pressure on the liquid reservoir; a magnetic valve; a timer which operates the valve; and a footswitch for starting and stopping.

The heart of the instrument is the timer. The time intervals during which the valve is open are represented by segments cut from a paper disk. The disk covers a circular metal plate which is rotated at constant speed by a synchronous motor. The open segments on the paper disk allow the timer contact to touch the plate, energizing the magnetic coil and thereby opening the valve.

Paper disks can be cut by the operator to provide any sequence of delivered volumes. In microbiological assay work, for example, samples and standards are dispensed with a disk carrying a series of segments of increasing size; water is added with a disk where the segments decrease; and media with a disk of equal segments.

In one series of researches at Wisconsin the operators set up assays involving 3600 individual measurements in half a day.



AUTOMATIC DISPENSER: A paper disk is infallible.

Titrating

The same instrument is adapted for titration by measuring the length of time a reagent must flow in order to reach the desired end-point.

A magnetic counter is actuated by a paper disk with closely and equally spaced notches around its periphery. Pressing the footswitch simultaneously opens the valve and starts the counter—which can be made to read milliliters, for example, by proper adjustment of reagent flow. There is no drainage error, no burette filling, no meniscus reading. An experienced operator can handle 1000 to 1500 titrations a day, each requiring 5 to 10 ml. of reagent, with an accuracy of ± 0.05 ml.

If the end-point is determined by a pH meter, the meter itself can replace the footswitch, making the titration fully automatic and eliminating any possibility of human error.

The valve regularly supplied measures volumes down to 0.1 ml., but a special valve for microanalysis measures volumes between 1 and 0.01 ml.

CASE FOR CRUDE

Survey finds that coal or oil shale cannot now compete with crude petroleum as raw materials for liquid fuels.

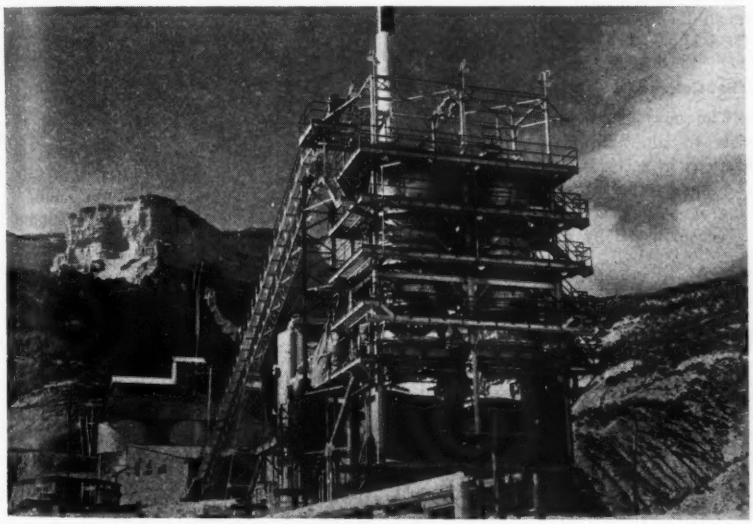
POPULAR INTEREST in synthetic liquid fuels has cooled considerably with the return of ample supplies of petroleum. But it's still a vital program in the chemical industry: Carthage Hydrocol, Inc.'s liquid fuel-from-natural-gas plant at Brownsville, Texas, the first such commercial installation, is moving along toward completion. The Bureau of Mines is continuing its work on coal hydrogenation, coal gasification to produce synthesis gas, and oil shale. Many companies are doing research on various phases of all processes. And everyone is interested in the cost of the products.

Most of the past available production cost estimates for synthetic liquid fuels have been calculated by the Bureau of Mines from its own data. Stanolind Oil and Gas Co.—the company that planned its own plant based on natural gas from the Hugoton field in Kansas, and then cancelled the project—however, has just made a technical and economic survey of synthetic fuels plants, which presents an industry estimate of current comparative costs. George Roberts, Jr., manager of the company's research laboratory, and Paul R. Schultz, manager of its economics department, have authored a report on it which concludes that liquid fuels from coal or oil shale cannot now compete economically with fuels derived from crude petroleum.

Three plants—one each based on oil

shale, bituminous coal, and sub-bituminous coal—of a nominal capacity of 10,000 barrels per day were postulated in representative locations selected on the basis of raw material supply, labor, water, and existing transportation facilities. (Because of indications that coal hydrogenation is less economic than Fischer-Tropsch, only the latter was considered a competitive alternate process in this comparison.) Plant designs technically feasible today were formulated and investment and operating costs estimated. Final product costs were debited with transportation charges reflecting product distribution to a common market (Chicago).

The source of oil shale was located near Rifle, Colo., with a retorting site nearby and a shale oil refinery in Chicago. In the bituminous coal case, Vincennes, Ind., was chosen as the plant site. Miles City, Montana, was chosen for the sub-bituminous case.



OIL FROM SHALE: Petroleum's still ahead.

As an index of comparison, a base case was developed for fuels from Wyoming crude. This oil is the least desirable of current crudes and would be the first to be replaced by other raw materials for liquid fuels. For the natural gas case that was developed, Gulf Coast natural gas was the synthesis raw material.

The Figures

Investment costs (dollars per daily barrel of equivalent gasoline, which adjusts different products to a comparable basis) are listed below:

Raw Material	*Investment*	*Cost*
Wyo. Crude	$ 9,500	$2.09/bbl.
Gulf Coast Natural Gas	6,200	0.12/MCF
Colorado Oil Shale ..	11,700	0.99/T
Ind. Bituminous Coal..	13,900	3.03/T
Mont. Sub-bituminous Coal	18,200	1.83/T

In these figures, producing costs of $6,800 were charged against Wyoming crude for exploration, dry hole expense, etc., but only $300 against natural gas. The raw material costs, however, for crude and natural gas are the assumed market prices which were used in determining final product costs.

Although the Bureau of Mines' most recent test runs give a direct cost of mining shale of 32.9¢/ton, this study yielded 80¢/ton direct cost and 99¢/ton with 14% charges on investment before taxes. All items of expense, including management, overhead, royalties and production and property taxes were considered in the costs of coal and shale.

Estimated costs of liquid fuels in cents per gallon of equivalent gasoline are: Wyoming crude, 12.2; natural gas, 15.0; oil shale, 22.5; Indiana bituminous coal, 22.5; and Montana sub-bituminous coal, 27.6. (The costs for Wyoming crude and natural gas do not include charges on investment for raw material production facilities since market prices were assumed for these items.) These totals represent direct costs (raw material, raw material transportation, processing and product transportation less by-product credits) plus 14% per year on the investment, which would pay off the investment out of profits after taxes in about 10 years.

Technological Changes

These figures are the basis for Stanolind's conclusion that current technology (on which they are based) does not permit synthetics from coal or oil shale to compete with products from purchased crude. Those from natural gas can if the competitive marketing area is carefully chosen.

Process improvements in coal synthesis which the Stanolind men believe have an even chance of success could reduce the cost of gasoline from Indiana bituminous to 17¢ per gallon, they estimate. Reductions in producing liquid fuels from coal are also possible. However, for the present, crude petroleum has a big edge.

UNIFICATION SPREADS

Through NSIA, industry and National Military Establishment cooperate to apply most advanced industrial techniques to national security.

THE more than 500 industrial concerns who form the National Security Industrial Association find themselves connected with an organization of expanding activity and increasing value both to the national security and themselves.

Formerly the Navy Industrial Association, this organization officially changed its name last June. The Association pioneered in providing an industry-Navy relationship in peacetime as a means of keeping industry alert to the needs of national defense.

Expands Scope

The Association is now taking steps to better serve the national welfare by providing the same type of service for the Army, the Air Force, and the Munitions Board.

Its activity is advisory in character, with recommendations of committees being submitted along with other points of view to the interested services of the National Military Establishment. Among the committees established are those for industrial mobilization, research and development, procurement, food, packaging, materials handling, and plastics. As industrial and research development progresses, these committees fill the increasing need for efficient missionary work and transmission of gains in one field to another.

The Plastics Advisory Committee under W. R. Sykes is one of the most active. As a result of problems brought before this committee, work has been initiated on development or production of many items such as reinforced unidirectional tapes, high-temperature-resistant materials to combat heat from air friction caused by high speeds, adhesives, protective coatings, transparent materials for aircraft which will withstand the erosion of rain, moldable polystyrene plastics, casting of polyester resins containing glass reinforcement, and the development of tough low pressure resins for the manufacture of items ranging from plastic pipe fittings, body armor and refrigerator space gratings, to one-piece 36-foot-long

boats designated by the Navy as LCVP's.

To Form Paint Committee

Plans are being made to expand the present Steel Coating Task Committee to a Paints and Protective Coatings Advisory Committee. This committee would assist in the solution of such problems as the development of short-term tests to evaluate the durability of paints with the objective of preparing performance specifications to replace the current formulation specifications, the development of air-dry coatings to withstand temporary exposure to aniline, hydrogen peroxide and fuming nitric acid, and development of a **deck coating** with improved abrasion resistance.

Membership in the NSIA includes many companies from the chemical, chemical equipment, and chemical processing industries. Headquarters are at 110 William St., New York 7, N. Y. A Washington, D. C., office has been established under the direction of E. Willard Jensen at 1420 New York Ave. N.W., and a Pacific Coast office at the St. Francis Hotel, San Francisco, in charge of H. D. Nuber. The Association has also designated regional vice presidents and district membership chairmen located in various cities throughout the country. Firms interested in membership should address inquiries to the New York office.

Member firms frequently find themselves involved in some rather unique activities. For example, 14 industrial members are testing in their plant cafeterias 600 recipes from the new Navy cookbook!

MIXER-CALMER

New approach to liquid-liquid extraction makes 50-60 extraction stages economically feasible.

Next month, a new kind of liquid-liquid extraction column will be unveiled at the Exposition of Chemical Industries in New York. It will show that extraction processes are no longer limited to five or six theoretical stages, that fifty or sixty stages are practical. This is the claim of inventor E. G. Scheibel of Hoffmann La-Roche, Inc., and manufacturer, Otto H. York Co.

The Column

The new York-Scheibel column consists of alternate calming and mixing sections in a vertical tube through which the liquid to be extracted and the extracting agent flow countercurrently. Mixing is accomplished by a series of agitators

E. G. SCHEIBEL: All in one column.

attached to a long shaft through the center of the tube. The shaft is mechanically turned by external means.

The heavier liquid is introduced at the top of the column and passes down through the packing which provides the calming section, countercurrent to the rising lighter liquid. The lighter liquid is introduced at the bottom of the column. After calming, the heavier liquid continues on down the column to the first mixing section where the agitator brings the two liquids into intimate contact, then alternately to other calming and mixing sections.

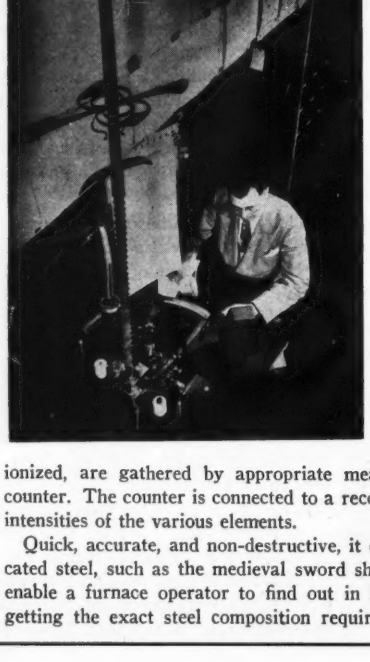
According to the manufacturer, this type of liquid-liquid extraction equipment is comparable in performance to fractional distillation equipment. The height of an extraction stage is generally lower than the height of a distillation plate. The extraction stage efficiency is said to be higher than distillation plate efficiency.

Uses

This equipment is something entirely new and, as yet, specific applications are few. A small commercial-scale column is now being constructed, as well as several pilot-scale units.

Many separations are said to be both convenient and economic in this apparatus. These include the separation of close-boiling mixtures; azeotropic mixtures; non-volatile mixtures; materials from dilute solutions; structural isomers. For example, a mixture of ethyl alcohol and methyl ethyl ketone, a minimum boiling azeotrope, can be completely separated to products of over 99% purity with only seven extraction stages. Thirty stages will separate the eutectic mixture of *o*- and *p*-nitrochlorobenzene. Recent work has shown that it is possible to separate six or more structural isomers by fractional liquid extraction.

GEIGER ANALYSIS



MORE FAMILIAR as a tool to measure radioactivity, the Geiger counter is now being used experimentally to analyze steel for elements of "middle" atomic weight—viz., chromium, manganese, molybdenum, nickel, copper, columbium, titanium, tungsten, and vanadium. The new method has been developed by the U. S. Steel Corp.'s laboratory at Kearny, N. J.

Analysis depends on the fact that the Geiger counter can measure secondary X-rays as well as radioactive emissions. The atoms in the steel sample are ionized by a flood of X-rays from a 20-milliamp., 50-kv., molybdenum-target X-ray tube. The secondary rays, characteristic of the particular atoms ionized, are gathered by appropriate means and scrutinized by a Geiger counter. The counter is connected to a recording potentiometer that plots the intensities of the various elements.

Quick, accurate, and non-destructive, it can be used on any piece of fabricated steel, such as the medieval sword shown in the illustration; or it will enable a furnace operator to find out in less than a minute whether he is getting the exact steel composition required by his order.

GO, NO-GO FOR LIQUIDS

Extractive crystallization, new liquid separation method, may mean cheaper petroleum hydrocarbons.

THE OIL BUSINESS being what it is—essentially unscrambling molecules as provided by nature and rearranging them into products more useful to man—petroleum chemists are constantly on the alert for new, better and cheaper unscrambling processes.

They now think they have one that not only meets these specifications but involves a wholly new principle of separation of organic liquids.

Called extractive crystallization, the method makes a separation on the basis of the shapes of the molecules involved, rather than—as in conventional liquid separation processes—their size, weight, solubility or adsorbability. The method in effect provides a molecular "go, no-go" gauge to the components of a liquid organic mixture.

Initially described at the American Chemical Society meeting this fall in a paper by W. J. Zimmerschied, R. A. Dinerstein, A. W. Weitkamp, and R. F. Marschner of Standard Oil Co. (Ind.), the method appears most promising at the moment for separating linear aliphatic compounds, such as the normal alkanes, from their branched and cyclic analogs. Those who have worked on the method, however, believe it has a broad variety of potential applications in both the petroleum and chemical fields. Shell Oil Co. has developed a continuous commercial process utilizing extractive crystallization and believes it can build a commercial plant to separate normal straight-chain molecules from others at a cost that would be at least comparable to other methods of separation.

One investigator has described extractive crystallization as being to crystallization what extractive distillation is to distillation. Essentially, the method consists of adding to a complex liquid mixture a material that will form a solid complex, or "adduct," with one or more of the components. This adduct is then removed and the desired component recovered by dissociation of the adduct with water, heat or some other means.

Formation of the adduct is through physical rather than chemical union. So far urea has proved to be the most suitable adduct-forming material for hydrocarbon separation work. Urea has the property of forming solid complexes with straight-chain organic compounds but not with branched or cyclic compounds. It is believed that urea permits straight-chain hydrocarbons actually to enter into its crystal lattice; branched alkane and cyclic molecules are too fat to squeeze in. A crystal appreciably more difficult to distort than urea would not permit adduct formation at all.

The formation of adducts occurs with *n*-alkanes of from 6 to at least 50 carbons in length. Precipitation tests with derivatives have confirmed the conclusion that the linearity of the hydrocarbon chain is the predominant factor in adduct formation. If of sufficient length, however, derivatives of slightly branched alkanes also form urea adducts, especially if the branching is at the end of the chain. To form the adducts, appreciably less than one urea molecule is required per carbon atom.

Investigations thus far indicate that only urea among its chemical analogs forms adducts with linear compounds. As work continues, however, other adduct-forming materials will undoubtedly be found and uses of the method as a separation procedure will be extended more generally.

CANADIAN PETROCHEMS

Predictions of big new petrochemicals industry in Canada fade in the light of facts.

RESERVES of crude petroleum discovered in Alberta in the past two years are so large that the area has been termed a "second East Texas." These reserves have caused many to suggest that Alberta is also on the verge of a petrochemicals boom.

But despite some rather glowing predictions to this effect from ordinarily well-informed sources, no one has yet suggested how and where the products of such an industry could be marketed competitively.

Far Away Places

The fact is that Canadian markets for petrochemicals are almost entirely in the East, 2,000 miles or more from Alberta. And rail freight rates in Canada are even higher than in the United States. Pipeline transportation is out of the question because of the relatively small volumes of chemicals that would be involved (*CI, Sept., 1949, p. 349*).

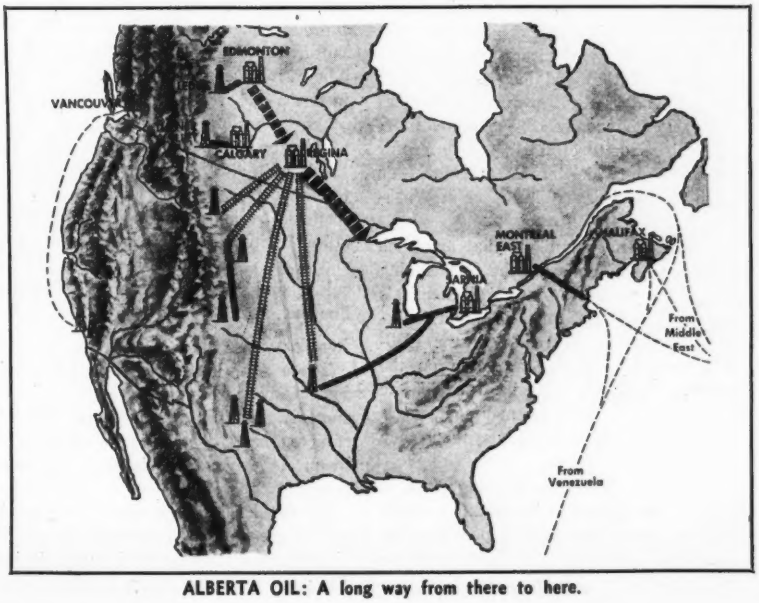
Proximity might suggest the North Central markets of the U. S., but that effective barrier, the tariff, seems destined to stand in the way for some time.

To Pipe the Crude

Already under construction by the Interprovincial Pipe Line Co., however, is a $90-million, 1150-mile crude oil pipeline from Edmonton, Alberta, to Superior, Wis. (see cut). There the petroleum will be transferred to lake tanker to move to Sarnia, Ont., and other Eastern Canadian refining centers.

Thus the most logical location for a petrochemicals industry in Canada is the eastern refinery area rather than far-off Alberta. But even here already well-established, low-cost aliphatic chemical operations—such as Shawinigan Chemicals, Ltd., at Shawinigan Falls, Que., from acetylene, and Dow Chemical Co. at Sarnia, Ont., from refinery gases—loom large as obstacles to any substantial further development at this time. These existing operations at present provide adequately for Dominion needs.

So it appears that talk of any big new surge in Canadian petrochemicals can, for the near future at least, be pretty well discounted as wishful thinking or simply a promoter's dream. As far as Alberta is concerned, the same can likely be said for a long time to come.



ALBERTA OIL: A long way from there to here.

SPRAY RESIDUES: Tolerances can clear the fog.

SETTING THE LIMITS

Hearings on insecticide residue tolerances can clear confusion in agricultural chemicals industry.

STRICTLY SPEAKING the problem of residues on fresh fruits and vegetables is a matter between the grower who uses insecticides, fungicides and growth regulants on his crop and the Food and Drug Administration which is responsible for the safety of the food reaching the public.

That's like saying that whether a horse wins a race is a matter of interest only to the animal and the jockey. Anyone who has pressed against the rail with a win ticket in his pocket knows better. That's why the agricultural chemicals industry (and the food industry, nutrition groups, and medical men as well) has circled next January 17, when the FDA public hearing to establish tolerances for poisonous or deleterious residues on fresh fruit and vegetables opens in Washington.

It is extremely unlikely that any such tolerance regulations will be forthcoming during the present agricultural chemicals season (Oct. 1949-Sept. 1950), and doubtful that any will be ready for the 1950-1951 season. Focusing attention on the problem, however, will have a definite effect on the industry by making farmers even more caution-conscious than they have become in the past year.

Specifically, evidence will be taken in order on the following points: (1) which fruits or vegetables require poisonous or deleterious substances in their commercial production; (2) what ones are required for each fruit and vegetable; (3) to what extent residues from these materials can be removed before marketing by washing, cleaning or other methods; and (4) the quantity of each that can be tolerated on fruit or vegetables without danger to the public, with other ways in which the consumer may be affected by the same or other poisonous substances from other sources given consideration.

Where the evidence indicates they are necessary, regulations will be issued to limit the quantity of such essential agricultural chemicals on fruits and vegetables. These residue tolerances will be fixed in terms of parts by weight, or by setting other limitations that may be necessary for protection of the public health. The FDA will also re-open the question of tolerances for fluorine compounds in insecticidal residues since an existing regulation limiting fluorine residues on apples and pears is ineffective because a judicial ruling limits the regulation to elemental fluorine.

Popular Target

These days a businessman who welcomes any government regulation is an anomaly, but in the case of residue tolerances, many companies in agricultural chemicals have been hoping for such action.

It's not hard to see why. Some products of the industry have been the target of numerous attacks, particularly during the past year—by many honestly concerned with the nation's health and food supply and by others concerned mainly with headlines. Congressmen up for reelection, medical men anxious to maintain their position as public protectors, sensationalist newspapers running short of murders—they have all taken turns condemning agricultural chemicals and threatening their producers.

Even where the motives are sincere, the hysteria with which the problem has often been approached has been out of reason. The chemical manufacturer has complied with all existing regulations; yet he has been in the position of not knowing when a local authority is going to ban his material, or when some Congressional investigation committee or feature writer is going to scare farmers out of using it. He has been afraid to introduce new materials.

How did the industry become a sitting duck for so much #6 shot? The wartime need for pesticides to give high yields of quality food and to protect the health of fighting men was one of the main stimuli to the industry's phenomenal growth in a relatively short period. Then there wasn't sufficient time to conduct chronic toxicity tests, and acute toxicity data were generally accepted as the basis for use in a well-calculated risk. These materials fulfilled their promise, and without deleterious effect on the food supply or personnel.

Changed Conditions

Since then, it has become apparent that certain pesticides build up in the human body and in animals used for food or dairy products. This has called for changes in use recommendations, the banning of DDT around dairy barns being a notable case.

So many new synthetic chemicals have been introduced in the last few years, however, that there just haven't been enough data to set meaningful residue tolerances, but industry, the U. S. Department of Agriculture, FDA, research institutions, colleges and universities have all been working on the problem. Information from such groups on test methods, toxicity, residues and residue removal will form the basis for such regulations as are drawn.

Whether a manufacturer (or other person interested in the production and distribution of a particular pesticide) wants his product included within the scope of the hearings may be up to him in some cases. In others, FDA on its own initiative will include certain materials, and will undoubtedly introduce evidence relating to toxicity. First, of course, necessity for using the material in question must be established. Chemical companies can depend upon farm and grower groups, land-grant colleges, food

processors, and others acquainted with improvement in yields and quality made possible by agricultural chemicals to help them carry the ball on this point.

Beyond Limits

There is a real fear, however, that some of the hearings may wander afield from the aims, and irrelevant data on the relative insecticidal efficiency of materials, use of less effective but less toxic insecticides, relative cost of the materials, and hazards to operators during manufacture and use may be included. Cost and effectiveness vary with location, climate, and each farmer's problem, and are hard to standardize. Moreover, the industry feels this is no part of the question at hand, and will resist any curtailment of selection by the grower based on such considerations. Hazards in use or production are the concern of public health authorities, and the manufacturers don't want that whipping boy dragged in here.

Despite the possibility of extraneous material being advanced in scare fashion and reported widely in the press, this first comprehensive collection of data on toxic residues will be a breath of fresh air to the industry. If the hearings result in (1) determining whether a residue problem exists from the use of a chemical and (2) a decision on the maximum tolerance permissible where such a problem exists, a firm foundation will be laid for the full exploitation of present insecticides, and development of new materials.

This cutting a path through the wilderness that now exists will bring some changes. Tolerances will be specified for specific residues on specific foods, and any excess will be a violation of Federal law. Other residues of specific pesticides may be prohibited on specific foods, and any residue would be a violation. Any other residue will probably be evaluated on an individual basis and will constitute adulteration (a violation) if it might injure the health of anyone eating the food it is on. A stronger enforcement policy can be expected against pesticides of doubtful toxicity for which tolerances are not adopted. These will be matters of primary concern to growers, and the chemical industry hopes for strict enforcement of FDA regulations to prevent further defaming of industry products resulting from farmers' disregard of recommendations.

For its part, the insecticide industry will have a major job in changing labels to comply with the new requirements. New spray schedules will have to be worked out to see that sprays still kill the bugs but leave residues within limits. Of more fundamental significance will be a slowdown in the introduction of new pesticide chemicals. In fact, this has already taken place. It is no secret that fewer materials would be in use now if sufficient data to write tolerances had been a requirement when they were introduced.

Gathering such data will amount to pre-testing a chemical prior to use, and there have been indications of interest in amending the Federal Food, Drug and Cosmetic Act to provide a system of advance control over new pesticides similar to that for new drugs.

There already exists an analogous system for economic poisons: Under the Federal Insecticide, Fungicide and Rodenticide Act, an economic poison must be registered prior to distribution in interstate commerce. An insecticide, fungicide or herbicide must be non-injurious to humans, other vertebrate animals, and vegetation (except weeds) when used properly as indicated in label directions. The Secretary of Agriculture is authorized to require descriptions of tests and results to support this and other claims made for the material, and may refuse registration.

The industry would be opposed to the dual jurisdiction that granting advance control to the FDA too would involve. It is generally in favor of tolerance regulations that will come out of the coming hearings, and wants to cooperate in the effort to protect the food supply; dealing with two government agencies before it could deal with its customers, however, would be too much of a good thing.

CORTISONE PROGRESS

Experimental synthesis of cortisone and related compounds from soybeans points to cheaper, more abundant drug.

CORTISONE and the related ACTH are sensational medical discoveries (*CI, Sept., 1949, p. 344*) but . . .

One "but" didn't loom so large last month when the Glidden Co., Cleveland, reported that its Soya Products Division researchers, headed up by Percy L. Julian, had synthesized cortisone from soybean sterols. The new synthesis is significant for two reasons: first, soybean sterols are readily available; second, it isn't necessary to use the special, expensive oxidizing agent, osmium tetroxide, that is required in previous methods.

Even more significant, perhaps, is Dr. Julian's synthesis of related compounds: 17-*α*-hydroxyprogesterone, 4-pregnene-17-*α*,20-*β*,21-triol-3-one 20,21-diacetate (pregnenetriolone), and 17-*α*-hydroxydesoxycorticosterone (compound S). It is possible that one or more of these compounds may be slowly converted to cortisone in the body, thus prolonging the therapeutic action. Compound S was isolated years ago by the Swiss sterol chemist, Reichstein, but it has never been available before in sufficient amounts for clinical testing.

Glidden is not usually thought of as a pharmaceutical manufacturer, but its interest in soybean oil and other soybean products led it to establish its Soya Division laboratory. Pioneer research on soybean sterols has been carried out during the past eight years, and the company supplies the hormones progesterone and testosterone in bulk to medicinal compounders.

None of Glidden's cortisone or related materials is available to physicians, hospitals, or the public. All of it is allocated to pharmaceutical manufacturers and clinicians for testing.

ACTH Use Studied

Meanwhile, close to 200 research people from 45 clinics studying ACTH, the pituitary product that stimulates the secretion of cortisone and other hormones by the adrenal cortex, met with their supplier, Armour and Co., in Chicago to exchange experiences with its medicinal properties. In addition to its value

PERCY L. JULIAN: Cheap sterol, no osmium.

in arthritis, ACTH has been found to be of definite value in rheumatic fever, gout, allergies, and several less familiar diseases.

But the clinicians had to take the bitter with the better: Use of the drug is attended by such dangers as heart failure, raised blood pressure, mental aberrations, and muscular weakness. There was a strong belief, however, that such dangers will be minimized when more is known about proper dosage.

All in all, it appears that cortisone and

ACTH development is in for a long, expensive uphill pull. But all the researchers involved in the various projects are confident that a practical route to production and utilization will be found.

BERGIUS UNBOUND

Fluidized dry coal hydrogenation gets away from high pressure restrictions of Bergius process, may bring synthetic gasoline closer.

IF THE initial experimental work is borne out, hydrogenation of coal as a method of producing synthetic gasoline may receive a significant boost from a new fluidized process under investigation at the Bureau of Mines synthetic liquid fuel laboratories at Bruceton, Pa.

The process promises to remove the necessity of carrying out the hydrogenation reaction at extremely high pressures, as in the familiar Bergius-I.G. process used by the Germans during World War II. This would mean elimination of the heavy, specially designed and expensive equipment required by the German process, and presumably reduce the overall cost of synthetic liquid fuels made by the hydrogenation method.

The Bureau of Mines process was described by H. H. Storch and co-workers before the American Chemical Society annual meeting at Atlantic City this fall. It consists essentially of passing preheated hydrogen at 400-600° C. and 500-1000 psi up through a fluidized bed of powdered coal. Overhead vapors are passed through a condenser, catch pot and filter to separate out the liquid hydrocarbon product.

This is in contrast to the Bergius process, which operates at 3,000 psi and in which the coal is suspended in a bath of oil. Hydrogen is bubbled up through the suspension.

Aside from the lower operating pressure, the Bureau claims several additional advantages for its dry coal process over the Bergius method. For one thing, it avoids processing a heavy oil to get out the hydrogenation products, a more difficult task than the separation of the overhead vapors obtained in the dry process. It eliminates hydrogenation of the recycle oil. And, according to some very recent work, the reaction goes faster when the hydrogen is in direct contact with the coal with no vehicle present.

Using a high sub-bituminous coal from Rock Springs, Wyo., the Bureau was able to produce a good middle oil consisting mainly of C_2 hydrocarbons but including an appreciable quantity of C_3's and C_4's. The oil was high in asphalt and fairly high in oxygen (5-6%), indicating a high proportion of tar acids. The high asphalt (55-74%) suggests the necessity of a second hydrogenation step, probably over a fixed bed, to get anything as light as gasoline.

These results, however, were without a catalyst. Use of catalysts gave a lower-asphalt oil.

Work on the fluidized dry process is still in its very early stages and there are many problems to be solved. One is the difficulty of injecting dry coal particles into a system under pressure. Another is the fact that about twice as much coal must go through the plant, as compared with the Bergius process, to get the same amount of oil. But these are obstacles the Bureau is working to remove and on which it feels it has already made a satisfactory start. It anticipates an ultimate decrease in the overall cost of coal hydrogenation by the dry method.

FAST TOUCH

New process speeds welding of aluminum, promises lower-cost process equipment.

COOPERATIVE research has paid dividends again. Battelle Memorial Institute, Columbus, Ohio, working with Air Reduction Sales Co., Murray Hill, N. J., has developed a newer, faster process for joining aluminum plate from ⅛" to 3" in thickness.

Faster, Better

According to Battelle the new process, dubbed Aircomatic, is at least four times faster for welds of equal quality than previous methods. No solid fluxes are required and there are no slags to be cleaned from joints. Use of a continuous electrode prevents time-consuming electrode changes. It is adaptable to any position—flat, horizontal, vertical, or overhead. A pistol-shaped welding tool is utilized. Bare or processed filler wire is fed in at a controllable rate and an arc is maintained between the work and the end of the wire.

Keep Air Away

Keeping air away in welding aluminum is a major problem. In common arc welding, rod coatings generate an inert gas which, with the slag formed by the coating on the weld surface, blankets the weld.

In Aircomatic, a sheath of argon or helium gas surrounds the arc and prevents air from coming into contact with the metal. Recent fundamental work by Air Reduction and Battelle on the composition of arc atmospheres produced by coatings has shown that the gas and slag are often inadequate to prevent contact between air and molten metal. Expansion of this study to the more general problem of composition of shielding gases finally resulted in use of the argon or helium atmosphere in Aircomatic.

SWIMMING IN BROMINE

Bromine replaces chlorine as disinfectant in many Midwestern swimming pools.

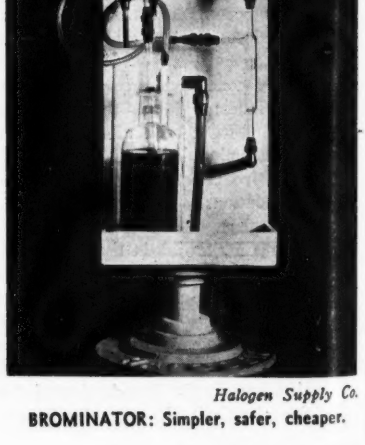
IF CHEMISTS who are familiar with the acrid, corrosive fumes of bromine were swimming last summer in the Glen Ellyn or Arlington Heights, Ill., public pools, they will probably be surprised to learn that they've been splashing about in a dilute solution of that noxious reddish-brown liquid. And they've probably experienced less eye and nose irritation in those pools than in their chlorine-disinfected counterparts.

About seven years ago many pool operators were tearing their hair in a frenzy. Chlorine—allocated for top-priority military uses—was hard to come by; and a substitute was badly needed.

Use of bromine for pools and water supplies was pioneered in the early '30s in California and Germany. Progress was nipped in the bud, however, by the growing importance of ethyl bromide used in conjunction with "Ethyl" gasoline, which cut off bromine supplies for other applications.

By 1941 bromine output was up, and harried pool-owners turned back the pages of history to rediscover the efficacy of bromine. A score of pools were equipped for bromination that year, and since then the number has grown—in spite of freer chlorine supplies since the war—to over 200 throughout Illinois, Michigan, and Wisconsin. Scientific study of bromine's germicidal action has demonstrated that it is as effective as chlorine at comparable concentration levels. Since bromine is a good deal more expensive, however, that fact alone doesn't account for its growing acceptance.

Curious about bromine's popularity, the



Halogen Supply Co.

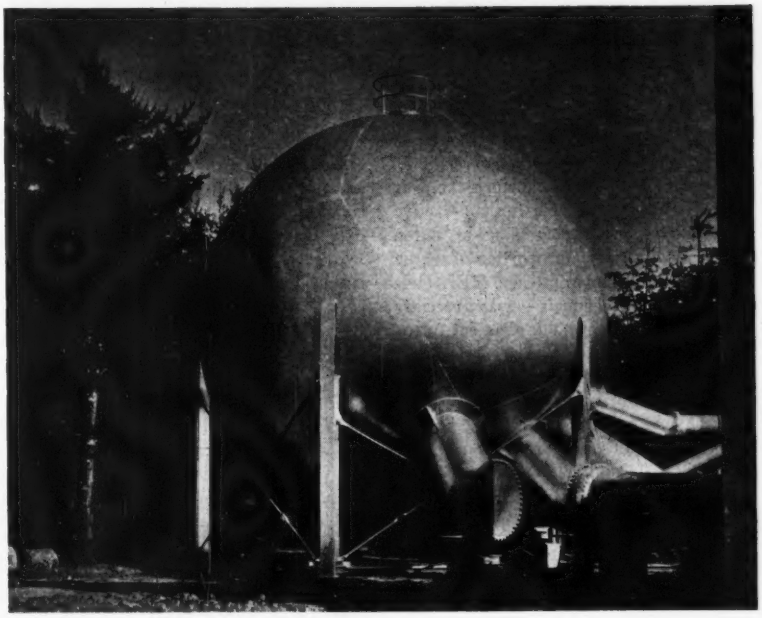
BROMINATOR: Simpler, safer, cheaper.

Illinois State Department of Health quizzed 54 bromine-using pool operators, and here are the answers it received: Half of the operators had complaints about odor when they were using chlorine, and three-quarters of them had complaints of eye or skin irritation; with bromine over 80% of them reported no complaints on either score. The majority also reported that brominating equipment is less troublesome, the filter sand stays cleaner, and there is less corrosion.

On treatment cost it's a toss-up between chlorine and bromine: 27% said bromine costs more; 34% said it costs less; and the remaining 39% had no conclusive answer. Those reporting lower costs mentioned that the equipment is simpler, safer, and less expensive. (Water is simply fed to the bottom of the original bromine bottle. On rising it dissolves a constant proportion of bromine and the solution is then proportioned into the inlet water—*see cut.*)

Other advantages of bromine not brought out in the questionnaire is the stability of the residual at high temperature (up to 90° F.) and in the sunlight.

SPHERE FROM RECTANGLES: Under Construction.



PRODUCT: A twenty-plate Icosasphere.

ICOSASPHERE

New layout of plates for spherical container reduces scrap, requires less welding.

SPHERICAL tanks for storing chemicals under pressure are a common sight around chemical plants. Now comes an improved and less costly version, the Icosasphere. This tongue-twisting name comes from the jargon of solid geometry and a look at its derivation provides a good description of the structure itself.

Why a Sphere?

Pressure storage in spherical tanks is economical for two major reasons: First, the area of shell per unit of volume contained is less than for any other shape—thus less steel required. Second, a sphere more effectively resists rupture by internal pressure than any other shape—still less steel required.

However, these advantages to a great extent had been outweighed by the extremely large amount of steel scrap produced in fabricating the conventional orange-peel design from rectangular plates. This has been a challenge to the engineer to simplify the procedure and still retain the obvious benefits of spherical design.

The Greeks Had a Word

The term Icosasphere is derived from the Greek word *eikosi,* meaning twenty. An icosahedron, for example, is the regular polyhedron with the largest number of faces, twenty identical equilateral triangles. Reduction of four of these adjacent triangles to one piece will form a parallelogram. A sphere results when five of these are properly distorted and welded. An even more important consideration, this layout is the best possible from the standpoint of scrap losses. Further, there is a concurrent reduction in the amount of welding required in making a spherical tank. According to J. O. Jackson of Pittsburgh-Des Moines Steel Company, who was responsible for the development of the new design, savings of well over ten percent over the standard orange-peel design can be expected.

Plates wider than about 100 inches are usually not economical because of the higher unit cost of such steel and the additional cost and difficulty of handling the larger plates. With this width the largest sphere that can be constructed is 14.8 feet in diameter. For larger spheres each parallelogramic unit must be subdivided into smaller units.

METALLIC SODIUM
Its Production and Use

by HERMAN W. ZABEL, Associate Editor

Ethyl Corp. at Baton Rouge, La. is now the largest producer of metallic sodium.

ONE OF THE FEW REMAINING HOLDOUTS against the current buyer's market in chemicals, metallic sodium, should join that group by mid-1950. At that time production capacity should be well over 200 million pounds per year.

METALLIC sodium is entering a new phase of its commercial life. For the first time since before the war it will be freely available for non-captive uses. Ethyl Corp.'s new plant at Baton Rouge, La.—a sizable proportion of whose production will move into non-TEL (tetraethyl lead) channels—was recently placed in full operation. Current plans call for National Distillers Chemical Corp.'s new unit at Ashtabula, Ohio, to start up by April 1950.

These two installations will add some 50% to the industry's production capacity of about 140 million pounds per year. All of National Distillers' product will be used in the production of materials other than TEL. These two units will advance sodium from a $25 million-a-year business to one grossing nearly $40 million annually.

Even with the addition of these two large plants, the production of sodium is still tied to the tail of the rapidly rising TEL kite. In 1947 TEL took nearly 50% of the total sodium production. In 1948 this take was increased to about 65% of an expanded production, and TEL is still expanding. But TEL is not the only high flier: Production of sodium peroxide, used primarily for whitening of groundwood pulp, will more than double within the next two years, while sodium hydride descaling of stainless steels should show a sizable increase.

TABLE 1
UNITED STATES METALLIC SODIUM PLANTS

Company	Location	Estimated Capacity (million pounds/year) Sodium	Chlorine
	Old Plants		
E. I. du Pont de Nemours & Co.	Niagara Falls, N. Y.	75	115
Ethyl Corp.	Baton Rouge, La.	64	99
		139	204
	New Plants		
Ethyl Corp.	Baton Rouge, La.	36	55
National Distillers Co.	Ashtabula, O.	36	55
		72	110
Total		211	314

PRODUCTION

All domestic sodium is made by electrolysis of fused sodium chloride in the Downs cell, the successor to the Castner cell which electrolyzed the lower-melting caustic soda. These two cell designs now account for practically all of the world's elemental sodium capacity. The Castner process is a modern version of the first preparation by Sir Humphrey Davy in 1807, that is, by electrolysis of fused caustic. However, sodium remained a laboratory curiosity until St. Claire Deville first prepared it on an industrial scale by heating soda ash, coal and chalk in an iron retort. This product was used for production of aluminum from aluminum chloride.

Castner first improved on this process in 1888 by substituting caustic soda for soda ash and a mixture of iron and carbon for a mixture of chalk and carbon. In 1890, however, he was left without a market for his product when Hall and Herout simultaneously discovered the electrolytic process for aluminum. But not for long. The Forest McArthur process for the recovery of gold from its ores required a dilute solution of sodium cyanide, manufacture of which was by fusion of metallic sodium with potassium ferrocyanide. Castner later developed the first version of the cyanide process now employed by Du Pont where the cyanide is produced by way of sodamide.

Always the improver, Castner next went back to Davy's original work and developed a cell for the electrolysis of fused caustic soda. Until the middle '20's this was the only commercial process. However, the current efficiency of the Castner electrolysis of fused caustic can never exceed 50% because of the large amount of current consumed in the liberation of hydrogen. Research eventually uncovered a practicable means of fusing the higher-melting sodium chloride for electrolysis to metallic sodium and chlorine. Several different cells were devel-

TABLE 2
GROSS SALES OF SODIUM METAL PLANT

	100%	80%
Sodium 36,000,000# @ 16.5c/#	$5,930,000	$4,740,000
Chlorine 54,000,000# @ 2.4c/#	1,297,000	1,038,000
Gross Sales	7,227,000	5,778,000
Gross Sales/ton Na metal	$401	$321

TABLE 3
ESTIMATED SODIUM METAL MANUFACTURING COSTS*

(*Per ton of sodium metal*)		
Investment/ton day of Na capacity†		$200,000
Working capital @ 20% of gross sales (Table2)***		30,000
Operating rate, % of capacity	100	80
NaCl 2.65 tons @ $0.75/ton**	$198	159
$CaCl_2$ 0.006 tons @ $24/ton	015	012
Power 10,400 KWH @ 5.6 mils	5,820	4,660
Cooling water, steam, etc.	300	275
Maintenance @ 4% of investment	2,192	2,192
Wages, salaries and misc. exp.	5,000	5,000
Operating Cost	13,525	12,298
Add Depreciation @ 6.5% of investment	3,560	3,560
Insurance and Taxes @ 1% of investment	548	548
Manufacturing Cost	17,633	16,406
Add Sales cost @ 10% of gross sales (Table 2)***	3,960	3,960
Research @ 3% of gross sales	1,205	964
Total Cost of Sales	22,798	21,330
8% return on capital after income taxes of 38%	8,130	8,130
10% return on capital after income taxes of 38%	10,160	10,160
	32,958	31,490

† 1.5 ton-days of Cl_2 produced per ton-day of Na metal.
* Daily production capacity = 50 tons Na and 75 tons Cl_2
** Data are for capacity operation.
*** Gross sales at capacity operation.

oped, but the cell patented in 1924 by J. C. Downs, of the Roessler and Hasslacher Chemical Co. (now the Electrochemicals Department of E. I. du Pont de Nemours & Co.), is the only one in use in the United States.

DOWNS CELL

The now-used Downs cell is a refractory-lined steel vessel. A graphite anode projects upward from the bottom of the cell. The cathode is a cast steel cylindrical ring, supported by two projecting iron arms, extending through the side of the cell to the electrical connections. A conical bell of iron or refractory, submerged in the electrolyte, collects the chlorine over the anode. An inverted submerged annular launder collects the sodium. Screens attached to the edges of this launder and between the electrodes prevent sodium from moving into a posi- where it might recombine with chlorine. Instead sodium passes continuously from the launder through a riser pipe attached to the top of the launder. Salt is charged through an opening in the cell cover. About 5 KWH are required per pound of metal.

The electrolyte is a eutectic of 33.2% sodium chloride and 66.8% calcium chloride. This lowers the operating temperature of the cell from well over 800° C., the melting point of sodium chloride, to 600° C. A mixture of sodium and calcium deposits at the cathode. However, the solubility of calcium in sodium decreases with decreasing temperature, and the heavier calcium crystals, which form in the product, as it is cooled while passing out of the riser pipe, settle back to the bath where they react to reform the equilibrium alloy. Filtration of crude molten sodium at 105-110° C. reduces the calcium content below 0.04%. Purity of the product is over 99.9%.

The estimated cost of production and sales are given in Table 3.

OTHER PROCESSES

Sodium can also be formed in a furnace such as that used for the production of metallic magnesium by the Pidgeon process, in which small briquettes of ferrosilicon and magnesia are heated to a high temperature under extremely low pressure. The heating takes place in the lower end of a long high-alloy tube. Magnesium distills out of the reaction mass as it is formed, condensing in the upper cooler end. Substitution of metallic aluminum—secondary aluminum would be used to reduce the cost—for ferro-silicon and a sodium compound for magnesia would permit formation of metallic sodium. However, it is difficult to procure sodium of the desired purity by this process.

Little is known of the procedure utilized by Dow Chemical Co. at Midland, Mich., in its now-halted wartime production. It is believed that sodium was recovered in the form of a lead-sodium alloy. It was presumably used for their production of indigo.

USES

The relatively high price* for sodium metal, 18½¢ per pound in drums, provides definite limitations on its use. (Although quotations are not available, this figure would presumably be reduced by 1-2¢ per pound for tank-car shipments.) Its extreme reactivity necessitates careful handling, and provides the basis for many processes which would otherwise be impossible. Also in its favor is the fact that its production is one of the few ways to produce highly desired chlorine without concurrently producing caustic soda. (*CI, June, 1949, p. 936*).

TEL

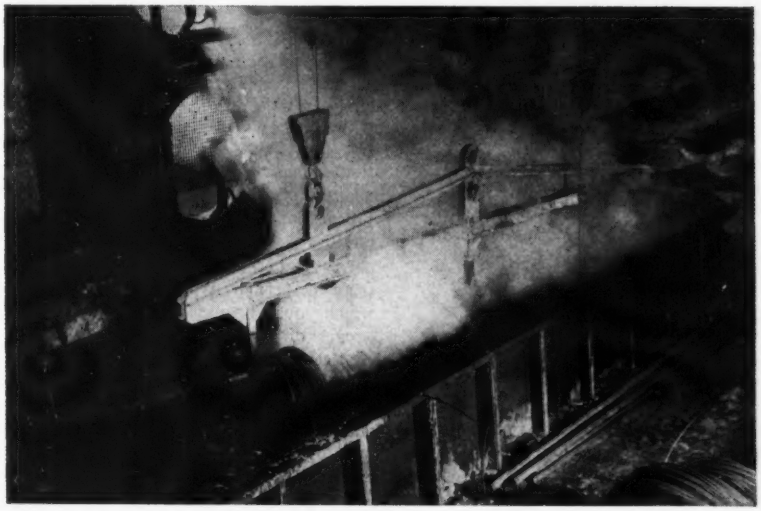
The growth of sodium metal as an industrial chemical is a story of increasing quantities required for the preparation of TEL. In 1948 sodium requirements for this use alone were nearly three times the total 1937 sodium production. A major portion of Ethyl's new capacity will probably find its way into TEL. Even without the introduction of the much-publicized Kettering high-compression engine, production of TEL will have doubled in the period from 1947 to 1950. The concomitant output of sodium will have doubled to about 120 million pounds per year.

There have been some reports that magnesium would be substituted for sodium in the preparation of TEL, but this possibility does not loom too large on the immediate horizon.

SODIUM ALKYL SULFATE

It is estimated that the two Procter & Gamble Co.'s plants at Ivorydale, Ohio, for glyceride reduction with sodium metal can use as much as 30 million pounds

* Very few 100 million-pound-a-year chemical intermediates sell for as much as 15c per pound.



Stainless steel wire is lowered into a water quench. The resultant steam blasts off the scale previously reduced in the sodium hydride descaling bath just behind the water tank.

per year. However, actual usage in 1948 fell well below this figure as the sodium manufacturers diverted it to other uses despite P. & G.'s continuing demand. P. & G. reduces triglycerides to the sodium salt of the fatty alcohol in the presence of methyl amyl alcohol. This alcoholate is hydrolyzed to the alcohol and caustic with water (*Ind. Eng. Chem., March, 1949, p. 438*). Sulfation of the alcohol and formation of the sodium salt of the sulfate produces the detergent which appears on the grocer's shelves as Dreft, Drene or a portion of Tide. Little immediate expansion in P. & G.'s demand appears to be in sight for—although the process to be used for its new plant in California has not been definitely decided upon—it is believed that new production will be by some form of high-pressure hydrogenation. It is expected that the present demand will continue, possibly reinforced by the requirements of one or two other fatty alcohol producers.

SODIUM CYANIDE

Sodium cyanide is formed by first reacting metallic sodium with ammonia to form sodamide and hydrogen. Treatment of the sodamide with carbon gives a very pure sodium cyanide and more hydrogen. In Du Pont's plant at Niagara Falls, the hydrogen liberated by the process provides the largest portion of the hydrogen requirements for their ammonia synthesis unit at the same location (*CI, June, 1949, p. 921*).

It is estimated that capacity production at Du Pont's Niagara Falls plant would require about 25 million pounds of sodium metal per year. Actual production in 1948, however, was probably well below 20 million pounds per year, reflecting the decreased demand by the Rohm and Haas Co. occasioned by the opening of their own hydrogen cyanide plant at Houston, Texas, and the difficulties in getting Du Pont's adiponitrile-from-furfural plant (*CI, April, 1947, p. 612*) into full operation. Other uses include case-hardening steel, in electroplating, and in dehairing of hides.

Rohm and Haas produces hydrogen cyanide from methane and ammonia as does Du Pont at El Monte, Cal. At Belle, W. Va., however, Du Pont dehydrates formamide to hydrogen cyanide. Because of this highly competitive situation little expansion in this market for sodium is foreseen.

SODIUM PEROXIDE

Although supplies of sodium peroxide (using about seven million pounds of sodium in 1948) are relatively easy at the present time, this is only a temporary situation as the operations of paper mills are now at a relatively low level. Sodium peroxide is used by at least twelve mills for the bleaching of groundwood pulp and for deinking. Hydrogen peroxide can replace sodium peroxide as a bleach, but it is more expensive.

It is estimated that this demand will at least double by 1951 as new sodium supplies become available.

TABLE 4
END USE PATTERN
SODIUM METAL

(million pounds/year)

Use	*1947*	*1948*
Tetraethyl Lead	66	90
Sodium Cyanide	25	32
Sodium Alkyl Sulfate	25	32
Sodium Peroxide	7	7
Sodium Hydride	2	2
Indigo Synthesis	2	2
Miscellaneous	6	6
	133	139

SODIUM HYDRIDE

Three million pounds are the estimated sodium metal requirements for the sodium hydride descaling of stainless steels in 1948. This process avoids the loss of relatively large quantities of high-value alloy metal entailed by the acid processes for descaling. However, it has a competitor in the fused Virgo salt descaling of alloy steels (*CI, Aug., 1949, p. 194*). Sodium hydride has the advantage of a shorter treatment cycle than Virgo, but the disadvantage of a higher investment cost.

OTHER USES

Smaller quantities of sodium (about two million pounds in 1948) are utilized in preparation of indigo and other dyestuffs; also for the production of potassium metal (*CI, Oct., 1949, p. 500*). These uses are not expected to expand.

Its use for reduction of fatty acid nitriles to amines, preparation of alkylsilicon compounds, as an alkylation catalyst, and for production of many other chemicals has also been patented.

Sodium metal has been tested for use in bus bars for electrical service. It can carry about three times as much current per unit weight as copper, but there is no known installation. Sodium has long been used as a heat transfer medium in sodium-cooled valves. The Atomic Energy Commission is considering both sodium and a sodium-potassium eutectic as reactor coolants in atomic power generation units.

THE FUTURE

The relatively high cost of sodium metal in relation to other high-volume chemical intermediates makes processes using it vulnerable to lower-cost materials as our technology expands. Its unique properties, however, should enable it to find many applications.

A rapidly expanding market for the manufacture of TEL is beclouded only by the possibility that metallic magnesium may be substituted for a portion of the sodium requirements. A superior printing paper is produced by brightening groundwood pulp. An expanding market is foreseen for this use. Most of the other major sodium uses are essentially static, and any further major expansions are thus open to question.

Reppe On Catalysis

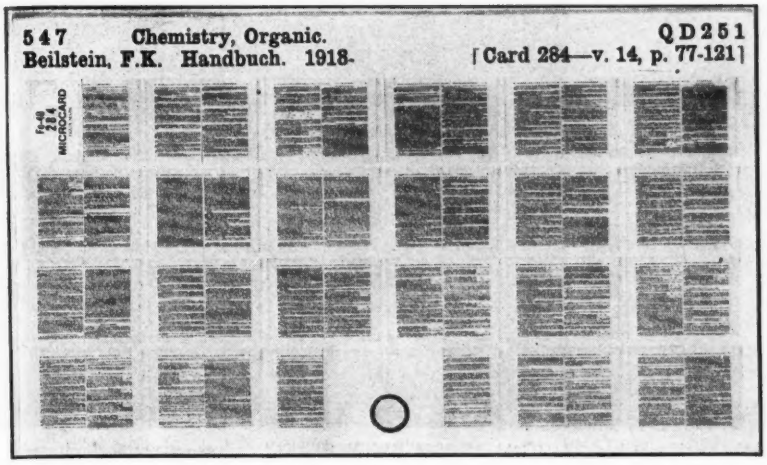
THE search for a catalyst suitable for any new reaction usually assumes the following practical form. Depending upon the type of reaction to be carried out, reference will be made at first to the various groups of substances known to possess hydrogenation, dehydrogenation, hydration, dehydration, or condensation activity, and an attempt will be made to adapt some of these substances by subjecting them to different variations (manufacture of mixed catalysts, addition of activators, various methods of preparation and preliminary treatment, etc.).

"A further indication may be gained from the periodic system of the elements, which must be explored if the known groups of catalysts fail. Here, no limits are set to the inspiration and imagination of the individual worker. A certain intuition, however, is needed here to point out the correct path, and the initial attitude of pure empiricism must soon be exchanged for a working hypothesis, which must be supported by the known facts of inorganic and organic chemistry.

"The working theories formed by the experimenter concerning the direction to be followed by him need not be absolutely correct; nor need they lead directly to the desired aim. The chemist must possess sufficient mobility to utilize his observations as a basis for modifying his working theories, daily if necessary, or for replacing them immediately by new theories as soon as he finds them to be in discord with the observations recorded by him.

"As I used to say, he must, in his work, find "the red thread" to guide his subsequent experiments. If he does not succeed in finding this "red thread" and in following it in his further investigations, his efforts probably will not be crowned with success. A useful catalyst cannot be developed at the present time on a solely empirical basis. Success in this work requires the utilization of comprehensive chemical and physical knowledge, as well as the application of untiring efforts. Beyond this, a certain creative ability is essential for successful work in the field of catalysis."

From "Autylene Chemistry" by Julius Walter Reppe, Charles Meyer & Co., New York.



Microcards double as text and index. Card file drawer holds equivalent of bookcase of books.

NEW MICRO METHODS Ease Storage and Finding of Facts

EDITORIAL STAFF REPORT

MICROFILM, MICROCARDS AND MICROPRINTS, combined with rapid selection methods, reduce time and expense of many technical library functions.

LIBRARIES usually double in size every 16 years, but with scientific research increased tenfold since prewar this rate is being exceeded by scientific libraries. Coping with the swelling flood of printed matter is a major headache for technical librarians.

Micro methods are already helping to solve this problem. As techniques and processes are improved, it appears to be but a matter of time until they play a major role in the recording of all types of scientific and industrial information. At this year's annual fall meeting of the American Chemical Society a day's symposium was devoted to the subject.

MICROFILM

Best known and oldest method of microdocumentation, as well as the most inexpensive copying process, is microfilm. However, few realize it also has the advantage of permanency to a degree far exceeding most paper stock. Newsprint and other sulfite papers, for example, have a life of only 10 to 20 years. "Few scientists," says Dr. Vernon D. Tate, Director of Libraries, Massachusetts Institute of Technology, "are as worried as they ought to be about this situation."

Indirectly microfilm copies also assist in the preservation of originals. Without danger of loss or damage, copies may be sent through the mails at a cost usually less than that of insuring the original document.

While microfilm will never supplant the printing press, its uses are rapidly growing. Microfilm X-rays permit a reduction of 90% in size. Banks and department stores make much use of microfilm, and the recent insurance refund for World War II veterans was organized around microfilm operations.

Microfilming has become so widespread that commercial processors are to be found in most large cities, although many business concerns process their own.

The eyestrain bugaboo of microfilm has been pretty well discredited. While a Harvard test group complained of eyestrain after several hours of using microfilm readers, a second group, paid 75 cents an hour to do similar work, had no eyestrain!

MICROCARDS

Microcards constitute a new method of publication, as contrasted to microfilm, which is a method of copying. Microcards are a microreduced text printed on photographic paper made of tough catalog stock which will stand more abuse than film. Printed to the international standard catalog card size of 7½ x 12½ cm., they are interfilable and convenient to handle and mail. Furthermore, they offer the unique combination in one unit of both text and index card. For quantity reproduction microcards are less expensive than microfilm. Costs range from about 15 cents for the negative and first print to about 5 cents per print in quantities of 1,000.

By attacking them all at once, microcards greatly simplify the problems of buying, storage, binding and cataloguing printed material. Half a card file drawer of microcards will hold the equivalent of a bookcase full of books. Besides saving on storage costs, the initial investment in microcards is from one-fourth to one-twentieth the cost in book or periodical form. Binding is eliminated, as is most or all catalog expense as each card is issued with five forms of headings: Dewey decimal system, Library of Congress system, subject, author, and title.

Microcards are issued under the direction of the Microcard Committee, a joint body on which are representatives of all the major American library associations. Issuance of microcards started early this year, and in the first eight months of operation a million cards were made. The first microcard catalog is about ready for distribution, and copies may be obtained from Dr. Fremont Rider, Wesleyan University, Middletown, Conn. Reading of microcards requires a 24-power magnification viewer which sells for $195 and is a little larger than a portable typewriter.

MICRO-COMBINATION

A method of combining microfilm and microcards has been devised by Dr. J. W. Kuipers, of the Eastman Kodak Co., Rochester, N. Y. A central file of 16 mm. microfilm strips is maintained. Five strips are simultaneously printed on each microcard, resulting in cards resembling the one shown above for Bielstein's *Handbuch*. These cards are made for documents for which wide distribution is desired, thereby eliminating the need for abstracting, or are printed to fill specific requests as they come into the library.

This method is preferred to lending out the original document. Popularity of the procedure is indicated by the 1200 pages of copy which are processed each working day at Kodak. These methods may also be used to supply essential information to branches of a company and for other internal publication purposes.

MICRO- AND MINIPRINTS

A microprint is a page of microreduced

(*Turn to page 833*)

MOBILE INFRARED ANALYZER, assembled within the past year, takes the analysis to the site of the problem. Another new tool is an . . .

AUTOMATIC COMBUSTION TRAIN for micro-scale carbon-hydrogen analyses of organic compounds. More specialized is the . . .

Organization and Functions of an Analytical and Testing Group

by R. P. CHAPMAN, Director
Analytical and Testing Division, American Cyanamid Co., Stamford, Conn.

CHEMICAL RESEARCH PROGRESS DEPENDS FUNDAMENTALLY and ultimately on accurate analysis. American Cyanamid Co. carries out this important function by a semi-centralized division operating independently of but in collaboration with other divisions of its research laboratory.

TO CENTRALIZE or not to centralize has been the subject of many discussions among the managers of industrial research, and the arguments in favor of one course or the other are well known. In practice each company has adopted a policy, somewhere between the two extremes, best suited to its own needs.

Within the research laboratory itself the problem of centralization also appears, especially in the organization of analytical facilities. Again there are several possible methods and again most of us probably avoid the extremes.

In its search for a solution to the first and larger problem the American Cyanamid Co. has established a central organization for general research at Stamford, Conn., a location geographically divorced from all its manufacturing units. In addition, the company maintains substantial establishments for specialized research in connection with its Calco Chemical Division at Bound Brook, N. J., and with its Lederle Laboratories Division at Pearl River, N. Y. Within the Stamford Laboratories a somewhat similar middle-of-the-road policy has resulted in the consolidation of groups doing the bulk of the analytical and physical testing work in the Analytical and Testing Division, one of seven major technical divisions set up for administrative purposes. (The other six are Research, Technical Service and Development, Chemical Engineering, Chemotherapy, Basic Nitrogen and Mineral Dressing.)

In general we believe that it is desirable to have the analytical and testing work done in an independent group such as this even though, for reasons of convenience, any of the other technical divisions may—and in some instances, do—make their own arrangements for analysis when limited to specialized aspects of a single field. In what follows an attempt will be made to describe the functions, organization and methods of operating in vogue in the Analytical and Testing Division of the Stamford Laboratories and the relations of that division with the other technical divisions.

FUNCTIONS

The research program at Stamford is highly diversified. It includes organic and physical chemistry research; application research and technical service in more than a dozen fields; and it provides for carrying a product or process through the pilot plant stage. All along the line analytical work is essential. Moreover, in connection with application research, particularly, a great deal of physical testing must be performed. Obviously, new products and new applications require the development of new methods of analysis and testing. A continuous program of forward-looking work, whether called method development or analytical research, must be carried on.

The Analytical and Testing Division is organized primarily to handle analytical and physical testing work for the Stamford organization and has no formal relationship with other units of the company. It does nevertheless render what assistance it can to sales, production and other departments when requested to do so. This assistance may include analysis and interpretation in connection with customer complaints (usually in collaboration with the Technical Service Division); special analyses which the plants are not equipped to handle; instruction in methods to be used with new products or processes; aid in the introduction of instruments; review of methods, etc.

We endeavor also to do our share in the collaborative work being carried out under the jurisdiction of various technical societies such as A.S.T.M., T.A.P.P.I., A.O.A.C. and aimed at standardization of test methods and equipment.

EAR STRENGTH APPARATUS for evaluating synthetic adhesives plywood. Alongside the new types of equipment is the old . . .

KJELDAHL APPARATUS for determining nitrogen content. Introduced in 1883, this analytical method is still used every day.

The functions of the division may therefore be summarized as follows:

1. To furnish analytical and physical testing service to all sections of the Stamford Laboratories.
2. To carry on a research program aimed at the development of new methods or the improvement of old ones.
3. To aid other units of the company when requested.
4. Collaborative work with scientific societies.

ORGANIZATION

Analysis today is a more complex business than ever before. Not only does a host of new materials or combinations of materials come out of our research departments every year, but also more and more attention is being paid to the less common elements. To complicate matters still further, the research man seems to expect more information than formerly.

On the other side of the picture, the present day analytical chemist has at his disposal a far greater assortment of tools than his predecessor of a generation ago. In addition to the classical procedures of qualitative and quantitative analysis, he has the microscope for use in identification work and the quantitative Pregl methods with their techniques for handling milligram samples, both of which have been widespread for a number of years. Still more recently and within a surprisingly short space of time, infrared and ultraviolet spectroscopy, to mention two examples of the modern instrumental approach, have become firmly established for both qualitative and quantitative work. And the end is not in sight yet. Even now analytical applications of nuclear chemistry are being considered and no one can say when sound may not be as useful in analysis as light is today.

PHOTOMICROGRAPH illustrates qualitative and even semi-quantitative microscope use.

These new tools are not just other ways of doing the job. They earn their salt because they enable us to do some things that we could not do otherwise and they enable us to do other things better. Nevertheless, valuable as they are, their introduction has been accompanied by some problems. Since their purchase often involves a substantial capital outlay, unusual care must be exercised in choosing the instruments best suited to the problems of a given organization. Having decided on what is necessary, one finds that good sound training in the major branches of chemistry as a foundation on which to build skill in analysis is no longer sufficient, for there must now be included instrumental training.

MANY SKILLS NECESSARY

The top flight analytical chemist of today and tomorrow must at least know what tools and methods exist so that he can reach an intelligent decision as to the best approach. The complete analytical organization must have experts in several fields if it is to render the best service to its "customers."

Physical testing, which is close enough in general nature to be grouped with analysis and which shares with it common interests and obligations, will require other tools and specialists depending upon the variety and complexity of the materials which must be dealt with.

The writer has been fortunate enough to see and play some part in the development of analytical facilities, both chemical and physical, in one organization to meet the requirements of modern research. This growth has culminated finally in the union of formerly scattered groups in the Analytical and Testing Division. For convenience in operation the division is organized in six groups together with the necessary auxiliary services (apparatus washing and secretarial) as follows:

General Analytical	22	persons
Analytical Research	4	"
Microanalytical	7	"
Instrumental Analysis	8	"
Microscopy	12	"
Physical Testing	16	"

Each group is headed by a group leader who is immediately responsible for the conduct of his group. It will be obvious that the basis for our subdivision is largely one of tools. Other methods of arranging manageable units are probably possible. The particular scheme adopted is, after all, less important than the good will, spirit of cooperation—in a word "team-work"—which exists. We foster the idea that it matters little what method we choose for a given job provided only that the one selected is most suitable from the overall point of view. Consequently, our group leaders are expected to be familiar with one another's facilities and to consult freely with each other.

The *General Analytical Group* handles miscellaneous chemical analysis by conventional or classical wet methods on many different organic and inorganic materials. Three or four key members of the group are assigned responsibility for major types of materials, but in the interests of flexibility there are no formal subdivisions even though the group is large. Investigation of such minor modifications in procedure as may be required by the job in hand are undertaken, but major investigations of new methods are

not attempted. In general the equipment in this and the research group mentioned next is such as might be found in any laboratory devoted to classical chemical analysis, although for convenience a flame photometer used regularly for sodium and potassium determinations is assigned to the group.

The *Analytical Research Group* is concerned with the development of new chemical methods of the classical type which appear to be major undertakings requiring concentrated and uninterrupted effort. The members of the group are expected to keep in close touch with developments in the field of instrumental methods and to call upon the men in this field whenever it appears that the latter could contribute to the solution of a problem. Their program includes first, development of methods for immediate use in connection with the current research program and second, methods which it is believed will be of long-range value.

The *Microanalytical Group* is set up primarily for the application of the Pregl methods to the quantitative analysis of organic compounds. The work includes many specialized micro methods as well as the so-called "group determinations." In addition to the day-to-day samples, the members of the group make a serious effort to expand their repertoire of micro techniques by a program of research.

INSTRUMENTAL ANALYSIS

The *Instrumental Analysis Group* complements the chemical analysis groups through the application of the physical approach. Its own equipment is supplemented by that available in the Research Division. The distribution of instruments between the two divisions is perhaps somewhat arbitrary. In general, it is based on the thesis that those instruments which are being used regularly in the course of our analytical investigations should be assigned to the Analytical and Testing Division. The instruments included in the Research Division, on the other hand, are utilized for the physical approach to the investigation of long-term research programs of a non-analytical nature. In either case, ideas for the development of new analytical instruments are developed with the full cooperation of the personnel of both divisions, regardless of where they may originate. In practice relatively few complications have arisen through this arrangement.

The major instruments available consist of spectrometers and spectrophotometers completely covering the spectrum from 210μ to 25,000μ as well as x-ray diffraction equipment. A Coleman spectrophotometer and a filter photometer constructed here are used occasionally to set up methods and associated working curves for analytical problems to be handled in the control laboratories of our plants. Development of Raman spectroscopy is going forward in the Research Division and facilities are available to us.

The *Microscopy Group* is concerned primarily with qualitative analysis, either as an end in itself or as a preliminary to quantitative determinations. Staff members trained in chemical microscopy, chemistry, geology, metallurgy and biology and with backlogs of experience in these specialties combine effectively and specialize in the detection or identification of physical-chemical phases in a great assortment of materials including synthetics mixtures, metals and ores, dispersions and emulsions, etc.; in interpretations such as are involved in "post mortems" and trouble-shooting, etc.; and in certain quantitative measurements such as micrometry of distances and areas, proportions of sizes, shapes, phases and refractive index.

Equipment includes polarizing microscopes and accessories for general work, integrating stage, goniometer, refractometer, micro-hardness tester, polishing equipment, cameras for micrography by visible and ultraviolet light, electron microscopes and accessories. A continually expanding file of reference specimens is most valuable.

The *Physical Testing Group* is concerned with physical properties rather than chemical composition. Although some of the company's products have purely chemical end uses, others are valuable partly or wholly because of their physical contributions. Examples of these are plastics, sizing for paper, and finishing treatments for cloth. In order to examine the important characteristics of such materials, the work of this group covers such classical fields of physics as mechanics, optics and radiation, temperature and electricity.

The instruments which are used are varied in their operation so as to depict faithfully the behavior of materials of such diverse properties as rubber on the one hand and glass on the other, or electrical conductors versus insulators.

The group is divided into six sections. Five of these handle specialized fields of physical testing. The sixth devotes its attention primarily to long-range development of testing equipment and methods.

METHOD OF OPERATION

Obviously records of some sort are necessary and there must be some means of integrating and coordinating the work of the various groups, not only within the department, but also with the other departments of the laboratory. At the same time it is desirable to keep red tape and paper work to a minimum. Points to be considered are:

Initiation of work
Master record of work either received from others or self-initiated
Distribution of incoming work to appropriate group
Worker's own record of his work
Reporting completed work
Arrangements for going back to old work
Charges (accounting)
Keeping informed

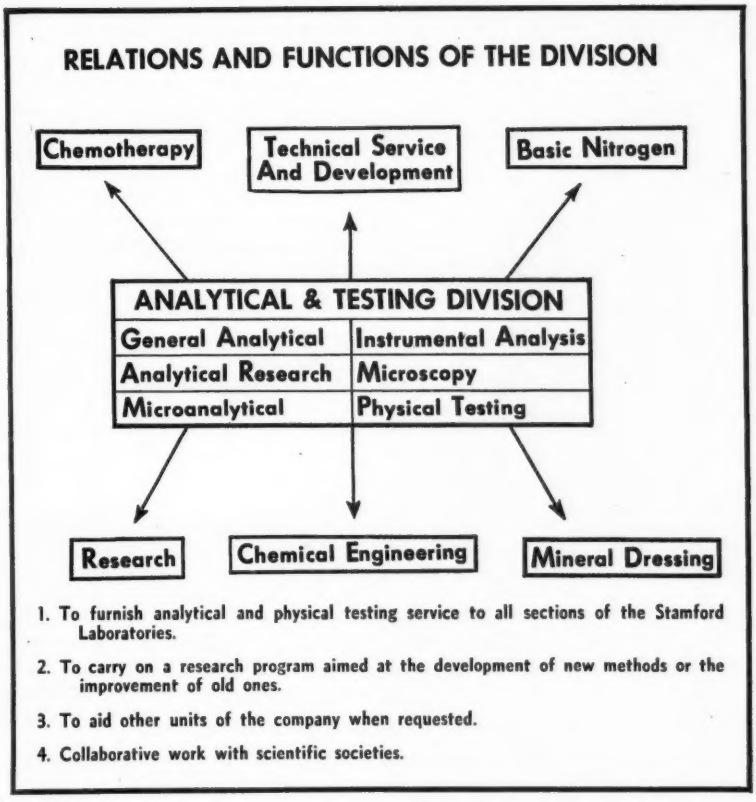
Many factors will influence the director in his choice of methods for keeping tab on these things and probably no two will choose the same procedure. One must, for example, offset the time consumed initially in keeping an elaborate set of records and index cards against the possible saving later on if it becomes necessary to go back through the record for certain data. Whatever plans are adopted must fit with the overall laboratory regulations.

In our organization the rule is that a written request with proper supervisory approval must be submitted before work is undertaken. This is true whether the work originates in another division of the laboratories or comes from another unit of the company. The request contains the name of the material, determinations desired and other pertinent information. At any point along the line from the man who wrote the request to the man assigned to do the work, questions may be raised as to the propriety of the request, the possibility that data not specified might be more useful, or the addition of background information which might be helpful. It has been found worth-while by past experience to keep a log book in the division office in which data regarding each request is entered. Frequently the tools of more than one group will be required. The group leader to whom the job is assigned initially is usually expected to look after this and is expected to see that all the data are collected at the end of the job.

REPORTS

When the work on a request is completed a report, prepared by the person or persons who did the work, is scrutinized and approved by the group leader or his assistant and in theory by the division director. In the case of direct service work for other groups in Stamford, only two copies of the report are normally prepared, the original being sent to the man who requested the work and the carbon copy kept in the division where it is filed chronologically according to problem number. These internal reports are brief, containing essentially a tabulation of results obtained for the information of the man who requested the work.

Reports on analytical research and on special problems from other units of the company are more elaborate. They are written and circulated in accordance with the general practice of the laboratories as a whole and form part of the permanent file of technical reports of the company. A standard circulation list is used


RELATIONS AND FUNCTIONS OF THE DIVISION
Chemotherapy
Technical Service And Development
Basic Nitrogen
ANALYTICAL & TESTING DIVISION
General Analytical
Instrumental Analysis
Analytical Research
Microscopy
Microanalytical
Physical Testing
Research
Chemical Engineering
Mineral Dressing
1. To furnish analytical and physical testing service to all sections of the Stamford Laboratories.
2. To carry on a research program aimed at the development of new methods or the improvement of old ones.
3. To aid other units of the company when requested.
4. Collaborative work with scientific societies.

and extra copies are sent to those who may have a particular interest in a given project. Because of the rather wide circulation these reports must be complete and understandable to readers who may not be familiar with the background of the problem or with all the details.

It might be noted here that the senior members of the division, particularly, are encouraged to suggest research topics which are believed to be of ultimate value to the company and which they would like to undertake. An effort is made to see that these individuals get some time to work on self-suggested problems of this sort.

In addition to the technical reports on specific problems mentioned above, there are monthly and annual reports from each group summarizing the activities of the group during the given period. These also are circulated. We try to make these reports informative without being unduly burdensome. They include a summary tabulation of work received and work completed during the period and brief statements regarding the status of the various major projects on the books of each group. They serve two purposes. First, they give a quick review of the overall picture to the director and others concerned. Second, they provide a regularly recurring opportunity for the group leaders themselves to appraise the various projects under way in their groups.

Each worker has his own notebook. This is issued by a central office, bears a serial number as well as the worker's name and when filled is returned to the issuing office for permanent filing. To facilitate reference to these original entries our reports contain spaces where the notebook number and page numbers are entered.

Each worker turns in a weekly time sheet showing the number of hours spent on each problem from which the accounting department calculates charges.

FULL INFORMATION GIVEN

It is a cardinal principle with us that the analyst is entitled to full information about the samples which have been assigned to him, not only to enable him to do an intelligent job, but also to give him more interest in the work. This is achieved in various ways. The work request itself is expected to contain pertinent information in addition to a description of work desired. The analyst is free to talk to the originator of the request if he desires. When new projects are under discussion, appropriate members of the division take part in the conferences just as they take part in subsequent conferences as the work progresses. The director is on the circulation list for all technical reports of the laboratories and sends on to individual group leaders any reports in which they have a special interest. Monthly and annual progress reports which the director receives from other divisions are circulated to group leaders who may use the information contained therein for discussion with individuals in their respective groups. Group leader meetings are held at the discretion of the director for discussion of technical or administrative matters.

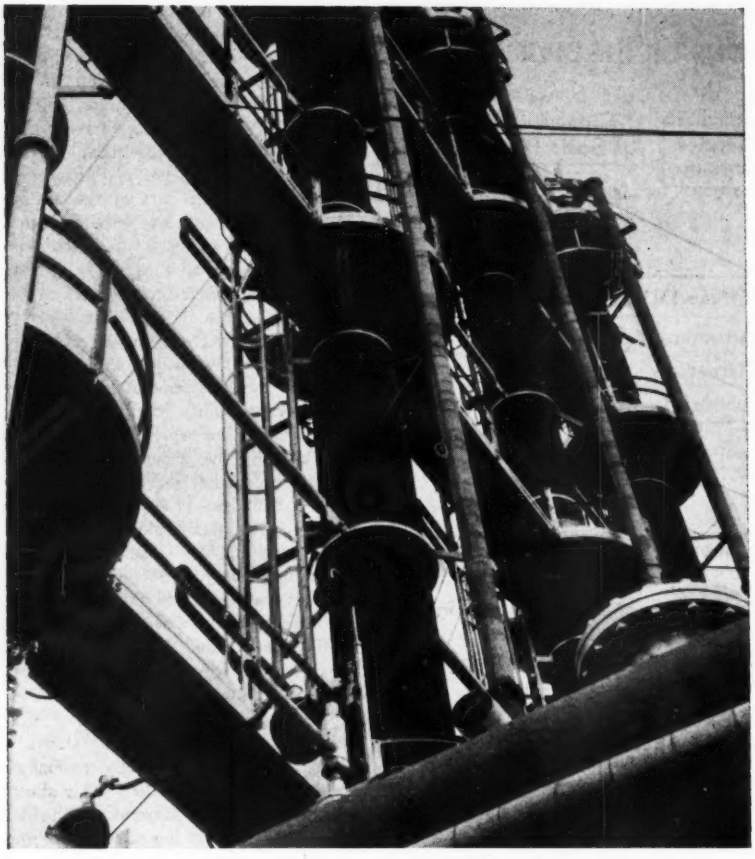
It goes without saying that confidence in the analytical department must be maintained at all costs and that eternal vigilance must be part of the stock-in-trade of every member of the department from laboratory assistant to director. Few experienced analysts need to be reminded that the single determination in error out of a thousand is the one that is remembered long after all the correct results are forgotten. We believe that the analyst himself must realize that his is the primary responsibility in this connection.

Of course, we provide for scrutiny and checking by the group leader and subgroup leaders but the man who actually does the analysis is expected to approach every determination thoughtfully and intelligently and be satisfied in his own mind that every step from his preparation of the sample to the calculation of results has been carried out correctly before he attaches his name to the report and thereby assumes responsibility for his results.

OPPORTUNITY OPEN

In these laboratories in common with other similar organizations today, the salary schedule for chemists engaged in analytical work is the same as for those in other branches of the science. The man engaged in analysis who is on his toes and is making a real contribution to our program has much to look forward to as the one engaged in synthesis or development. Actually, the recent graduate who joins one of our analytical groups will find himself in the best possible position to get a bird's-eye view of the company's products, processes and problems, if he is interested in so doing, because sooner or later everyone comes to him for assistance. We hire our men with the expectation of the same permanence of employment as in any other division. At the same time, the overall policy of the laboratories permits transfers between departments if the occasion arises.

The analytical chemist and his counterpart in the realm of physics, with all the modern tools and techniques at their disposal, are important individuals to the chemical and allied industries because of the contributions they are making in cooperation with others to the development or improvement of products and processes. To the writer at least, the decision by this and other companies to consolidate chemical and physical analysis in a single department as a primary unit in the research organization is confirmation of his belief that groups engaged in such work are full-fledged partners along with those engaged in synthesis and application, etc., in the business of industrial chemical research.



Phillips Petroleum Co. still in which hydrocarbon fractions are separated.

PETROLEUM Resins and Oils Gain in COATINGS FIELD

by ROBERT R. RUTHRUFF,
Consulting Chemical Engineer
Homewood, Illinois

PETROLEUM HYDROCARBONS are a cheap source of film-forming oils and resins, but wider use hinges on improved and lower-cost processing. Ether resins synthesized from petroleum-derived phenols and epichlorohydrins are a new type of great interest and potential value.

THE PETROLEUM industry has long been plagued with a series of low-value and frequently highly deleterious by-products which have a formal resemblance at least to the resins and drying oils employed in surface coatings. Asphalt and the gum of cracked gasolines may be cited as examples.

It is not unnatural that the petroleum industry, especially after reviewing the price structure of resins and siccative oils, sought to introduce their vaguely similar by-products to the surface coatings industry. Generally, these products were of even less value to the surface coatings industry than to the refiner. The refiner was usually equipped to burn these materials while a paint plant, as a rule, was not.

Since such unprocessed by-products could be employed by the surface coatings industry, if at all, only in the lowest-grade and cheapest finishes, attention was next directed to the chemical processing of selected petroleum by-products in an effort to produce more satisfactory materials. While a few of these are quite interesting, the great majority are fair or poor.

The next step involved the chemical union of selected petroleum fractions with non-hydrocarbon organic materials; and a number of extremely interesting products have been developed by this procedure.

Finally, many valuable surface coatings components have been prepared from non-hydrocarbon chemicals derived from petroleum hydrocarbons. It would appear that this method of approach is the most promising—although, as would be expected, the resulting materials are rather expensive, frequently being non-competitive cost-wise with conventional resins or oils.

In the present paper, consideration will be given to examples of each of these four types of materials. Obviously, practically all surface coatings materials can be derived, actually or theoretically, from petroleum; so, to keep within reasonable bounds, only one or two examples of each type can be given even brief consideration.

UNPROCESSED HYDROCARBONS

As produced, cracked gasoline contains traces of highly unsaturated hydrocarbons which gradually polymerize or undergo oxidative condensation with the production of gum. These potential gum-forming components may be removed by subjecting the gasoline to polymerizing conditions considerably more severe than encountered in normal storage.

This may be accomplished, for example, by passing the gasoline in the vapor phase over an active clay, the well known Gray process being a typical example of such a procedure. During this treatment, the highly unsaturated hydrocarbons are polymerized to materials boiling above the usual gasoline range and are eliminated as bottoms in admixture with hydrocarbons of the kerosene and light gas oil boiling range present in small amounts in the original gasoline charge. A typical Gray tower bottom contains about 50% of 50-100 iodine number material of gasoline boiling range, 25% of 80-100 iodine number kerosene and a trace of heavier hydrocarbons of 200-300 iodine number, the remainder being comparatively non-volatile polymers having iodine numbers up to 300.

Conventionally, these bottoms are diverted to pressure still charging stock but they may be reduced with fire and steam to practically any desired viscosity, vacuum reduction (10-15 mm.) being resorted to after the more easily volatile hydrocarbons have been removed. Final re-

duced bottoms may be eliminated as very viscous liquids (e.g. 700 seconds SU at 100° F.) or even solids may be produced. It has been concluded, on the basis of very meager experimental evidence, that films of these materials dry through oxidation when exposed to air at low temperatures and by polymerization when baked.

These materials give very dark films and, when air dried, the films are brittle. They exhibit good water and alkali resistance, as would be expected. In an attempt to overcome the brittleness of these films, the reduced bottoms have been cooked with, say, an equal weight of linseed oil. Such mixtures dry to a flexible film which, however, checks badly on exposure to strong light. A very high baking temperature (410° F.) is required with these oil-bottoms mixtures but the final film is fairly satisfactory for certain purposes, for example, in can coatings.

FILMS FROM BOTTOMS

Recently, a series of reduced bottoms, characterized as "light-colored" has been introduced. The color of even a 50% solution of a typical member of this series is 9L Hellige, a color characterized by varnish makers as "very dark." When used to the extent of only 20-30% as an oil replacement in pigmented interior finishes, these so-called light-colored reduced bottoms result in films somewhat optimistically characterized as "light ivory." In addition, films containing these oils exhibit after-yellowing, a behavior quite characteristic of materials of this type which have been decolorized by acid or contact or percolation clay treatment.

Materials of the type considered in this section are suitable for certain limited uses such as components of core oils and in dark, low-grade industrial finishes. The "light-colored" varieties may possibly be employed to a limited extent in dark tints or full shades of trade sales items of the type where cost rather than quality is the primary consideration; although at a price of 10-15¢ per pound these materials will result in only a slight reduction in cost.

PROCESSED HYDROCARBONS

RESINS FROM DRIP OILS

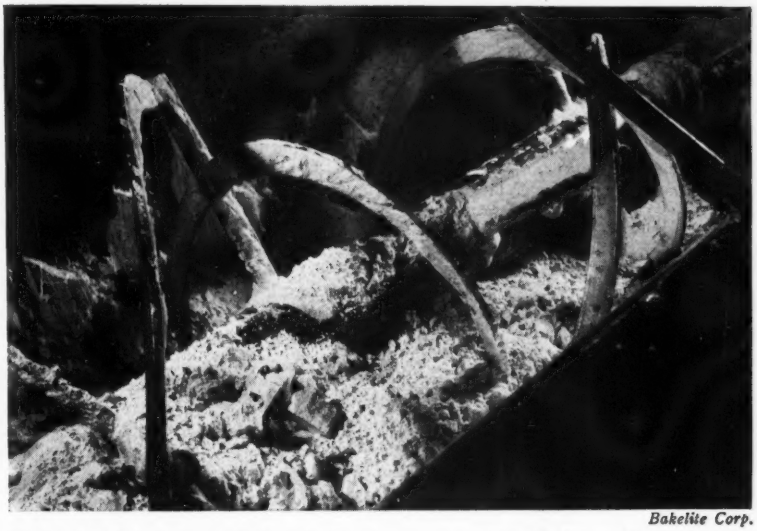
It has long been known that certain components of coal tar can be polymerized to resins. Coumarene-indene resins were first prepared some sixty years ago and have been commercially available for the past forty years. These materials are produced by polymerizing the appropriate coal-tar fraction with the aid of such agents as sulfuric acid, stannic chloride, antimony pentachloride and boron fluoride.

Within recent years, certain petroleum processes have produced by-product oils rather similar in composition to these coal-tar fractions and comparable resins have been prepared from them by similar methods. In the manufacture of ethylene by the pyrolysis of gaseous hydrocarbons a small amount of liquid by-product is produced. This "drip oil" is rich in cyclopentadiene, indene, styrene and similar hydrocarbons and can be readily polymerized catalytically to solid or liquid products.

Liquid polymerization products of this type are commonly produced in the viscosity range 100-250 seconds SU at 210° F. with an iodine number range of 125-275. The solids usually have a ring and ball softening point of from 150-250° F. and iodine numbers of from 75 to 325. In general, both the solids and liquids are soluble in ordinary naphthas and are completely miscible with drying oils, although a few require high solvency naphthas and are incompletely miscible with oils. Films made from these materials usually show good to excellent heat stability and resistance to acids, fair to excellent alkali resistance, and good water resistance.

These resins and oils are dark colored and almost invariably produce brittle films. Also, unless the film is pigmented, light resistance is poor. On replacing as little as 25% of conventional resin with one of these solids, staining is usually so pronounced that it is impossible to produce light tints. While the resulting formulation is superor to the conventional standard in drying and cold-water resistance, the films become brittle in thirty days. Also the film is inferior to the standard in alkali resistance.

It is impossible to decolorize these resins satisfactorily. Some color can be removed by acid or by contact or percolation clay treatment but the acid and clay requirements are so high as to make the process economically unfeasible. Furthermore, varnishes made from the decolorized resins revert during drying so that the color of the resulting dry film is scarcely to be distinguished from one prepared using the untreated resin.



Bakelite Corp.

Vinyl resin—derived from petroleum hydrocarbons—are pre-blended prior to Banbury mixing.

HYDROCARBON COPOLYMERS

A number of materials, some of which are of interest to the surface coatings industry, have resulted from the synthetic rubber program. These are copolymers of two or more hydrocarbons, for example, isobutene and styrene or isobutene and butadiene and are produced by the low-temperature polymerization of such mixtures in the presence of aluminum chloride, boron fluoride and the like. Generally speaking, these materials are odorless and of very pale color. They body rapidly with drying oils but are not too compatible with polymerized oils. Varnishes containing these copolymers usually exhibit a high viscosity at low solids content.

Fifteen to eighteen gallon oil length varnishes made with these resins are superior to conventional varnishes in initial dry, but the difference is erased within 24 hours after application. Flexible but rather soft films are produced which exhibit some aftertack and a slight haze. These films are inferior to those produced by conventional varnishes in resistance to hot and cold water, soap and alkali. The films are markedly non-resistant to grease and they after-yellow in the dark.

While these materials exhibit many disadvantages, they are of considerably greater potential value than the hydrocarbon polymers previously considered,

especially in view of the light color and good flexibility of films produced through their use. It is believed that very interesting materials might result from further work in this field, although this is perhaps too optimistic in view of the fact that present manufacturers appear to be unable to produce uniform products from run to run—material from one batch being, for example, much more reactive than that from another. Furthermore, these materials, even if perfect, are presently priced so high as to preclude their use in any but the most specialized applications.

HYDROCARBON COMPONENTS

STYRENE OILS

Styrene polymers have been known for over a century. The polymers are obtainable in a wide range of molecular weights. Polymers of sufficient molecular size to exhibit softening points of interest to the surface coatings field are usually insoluble in conventional vehicles.

Comparatively recently, copolymers of styrene and drying oils have been utilized in the formulation of surface coatings. These copolymers dry rapidly (the film forming primarily through solvent evaporation) to give, in general, tough, adhesive and fairly hard films of good color (with excellent color retention) and high gloss which exhibit good resistance towards water, alkalies and acids. Styrene-oil copolymers are not perfect, however. Their odor is objectionable, they are not too compatible with conventional film-forming ingredients, and their films become brittle when aged and have a low resistance to gasoline and solvents. Furthermore, unless great care is exercised when preparing the copolymer, more or less straight styrene polymer forms; and this leads to even greater compatibility difficulties, frequently resulting in cloudy varnishes which give hazy films.

In general, approximately equal parts of oil and styrene are cooked together in the presence of a catalyst such as hydrogen peroxide, benzoyl peroxide or sulfur dioxide to produce the copolymer. The required amount of hydrocarbon is added to the oil at 350° F. over a period of several hours following which the temperature is increased to 450° F. and held until the desired body is obtaned. Gelation of the reaction mixture usually occurs if an attempt is made to secure complete reaction of styrene. This may be prevented through use of certain retarders. When retarders are employed, practically all of the added styrene reacts without formation of gel.

Copolymers exhibiting the most rapid drying rate result when the reaction between styrene and oil is carried to the ragged edge of homogeneity. Such materials, when formulated into finishes, frequently separate in the can. Copolymers containing an oil with conjugated double bonds (dehydrated castor, tung) are, in general, more compatible than copolymers containing exclusively non-conjugated oils such as linseed and soya. It is not necessary to employ conjugated oils exclusively to achieve improved compatibility: If 30 to 50% of the total oil component is conjugated, improved compatibility results. Incorporation of a little resin in non-conjugated oils has a similar effect.

Improved mineral spirits tolerance also results if a portion of the styrene component is replaced with alpha-methylstyrene; even a 90:10 styrene:alpha-methylstyrene mixture results in considerable increase in tolerance. However, films of such three-component copolymers exhibit an even lower gasoline and solvent resistance than straight styrene-oil copolymers. This low solvent resistance results in poor recoating properties. An oil-styrene-methylstyrene copolymer film exhibits poor solvent resistance even after aging for several weeks. Improved solvent resistance can be achieved by replacing some of the styrene with divinylbenzene.

Generally speaking, an increase in the mineral spirits tolerance of a copolymer is accompanied by a decrease in drying rate. On the other hand, drying rate increases (as well as the toughness, hardness and alkali resistance of the resulting film) as the styrene/oil ratio is increased. This is accompanied, however, by a reduction in adhesiveness of the film.

The embrittlement of the copolymer films on aging has been mentioned. This may be largely or completely overcome by incorporating medium-length alkyds in the copolymer formula.

CATALYTIC AROMATIZATION

It has long been known that aromatic hydrocarbons condense with formaldehyde under suitable conditons to form solid resins. The ability of various aromatics to react in this manner varies widely. Benzene, for example, reacts with extreme difficulty while naphthalene condenses with formaldehyde with extreme ease. The resulting resins likewise show wide variations in physical properties, depending upon the aromatic hydrocarbon utilized in their synthesis.

Figure 1 shows the variation in linseed oil solubility and resin hardness of a series of materials prepared from naphthalene and various alkylnaphthalenes as a function of the number of carbon atoms in the side chain or chains. From this figure it is evident that only a limited number of hydrocarbons of the particular series under consideration condense with formaldehyde to produce resins exhibiting at the same time complete solubility in linseed oil and the requisite hardness to be of interest to the surface coating industry. Alkylnaphthalenes containing two or three alkyl carbon atoms (e.g., the dimethylnaphthalenes) fall into this select group. Resins from alkylnaphthalenes containing four or more alkyl carbon atoms are too soft, while resins from the monomethylnaphthalenes are on the ragged edge of linseed oil solubility. Naphthalene itself produces a very hard resin but a considerable portion will not dissolve in oil.

RESIN FROM NAPHTHA

In the catalytic aromatization of heavy naphtha, the so-called polymer is obtained as a by-product. The production of this polymer is small from the standpoint of the petroleum industry but is enormous from the point of view of the surface coatings industry. This polymer is rich in naphthalene and more especially in alkylnaphthalenes. On the basis of the data presented in Figure 1, it was concluded that certain portions of this polymer might serve as a cheap and readily available raw material for the production of formaldehyde resins.

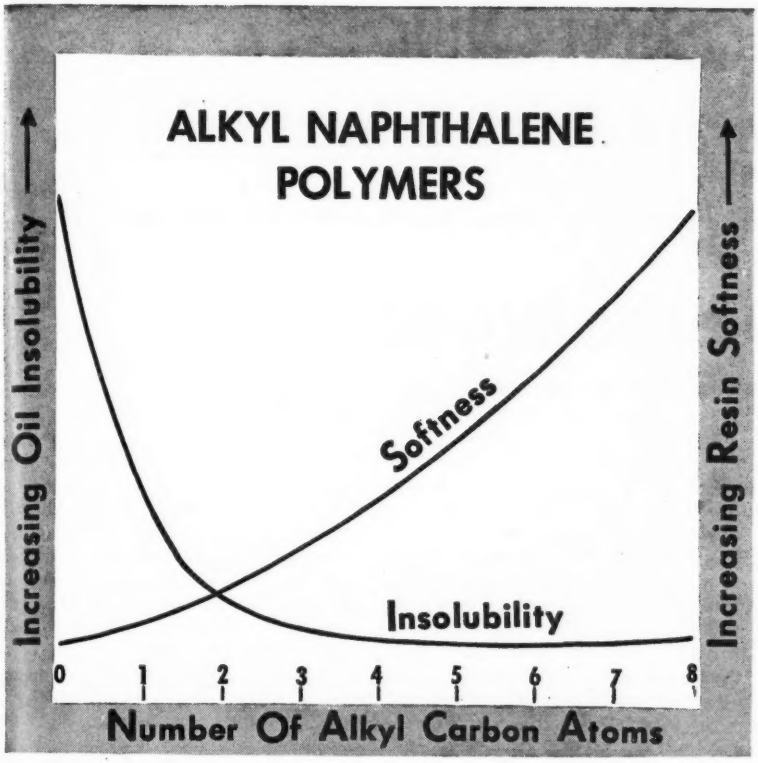
In most of the work briefly considered subsequently, the total polymer was roughly fractionated, taking overhead and discarding the first 15% of the charge (naphthalene and monomethylnaphthalenes) and then continuing the distillation until a total of 60% had been taken overhead. This 15-60% heart cut was commonly employed as the hydrocarbon charge in the resin-forming reaction.

The resin-forming reaction is conducted under anhydrous conditions and, accordingly, gaseous formaldehyde or a formaldehyde polymer (preferably paraformaldehyde) must be used instead of the 40% formalin solution usually employed in forming resins.

A condensing catalyst is necessary and many are suitable, among them being anhydrous chlorides of iron (ic), calcium or zinc, sulfuric acid and phosphoric acid.

The homogeneous reaction mixture is brought to the boiling point and is heated under reflux for about 8 hours to form the resin. By replacing some 10% of the acetic acid solvent with certain promoters the reaction time can be reduced to 2-3 hours. As the resin-forming reaction proceeds, phase separation becomes increasingly apparent.

At the conclusion of the resin-forming reaction the two-phase mixture is allowed to separate, the resin layer is withdrawn, diluted with naphtha, and washed acid-free. The washed resin solution is distilled to remove solvent and unreacted polymer, initially at atmospheric pressure and finally at 10-20 mm. pressure. After reduction, the bottoms are run into pans to cool and solidify. The resin usually has a color of 5-6 Hellige in 50% solution. The resin yield and solidification point are a function of the extent of reduction. On eliminating bottoms having solidification points in the range suitable



for use in surface coatings, the yield of resin is in the range 75-85% theoretical.

Films of 21 gallon length linseed oil-polymer resin varnishes exhibit excellent durability after about 6 months' exterior exposure under tropical conditions. At the end of this period the films were dirty but, after cleaning, were in good condition with no visible checking or cracking. Films of a similar varnish in which the polymer resin was replaced by a modified phenolic were, after the same exposure, dark, mildewed, rough, and scaly with visible checking and cracking. Films of 38 gallon length tung oil varnishes, one containing polymer resin, the other a 100% phenolic, were both dirty but in good condition after about 6 months' exterior tropical exposure.

NON-HYDROCARBON RESINS

VINYL RESINS

Vinyl chloride may be prepared from ethylene or, more conveniently, from acetylene. Polymers of this material have been known for more than a century. These polymers are hard and tough but so insoluble as to preclude use in surface coating formulations. Polyvinyl acetate, on the other hand, is a relatively soft resin, soluble in a wide variety of solvents.

The two resins are mutually incompatible but when a mixture of vinyl chloride and 10-15% vinyl acetate is copolymerized, an extremely tough and chemically inert resin results. This copolymer is colorless, odorless and tasteless and is unaffected by acids, alkalies and oxidizing agents. It is insoluble in conventional low-grade solvents but dissolves readily in ketone-type solvents such as isobutyl methyl ketone and isophorone. The copolymer has a somewhat low softening point and is rather unstable when exposed to high temperatures or to light, due to the deleterious action of traces of hydrogen chloride split off under such conditions. The elimination of hydrogen chloride from the resin molecule is accelerated by metals. This is unfortunate since most vinyl resin films are formed by baking and frequently are formed on metallic surfaces. A number of stabilizers are available which retard film deterioration to a greater or lesser degree. Also, it is necessary to plasticize the film, several good plasticizers being available.

One of the major disadvantages of vinyl chloride-acetate copolymers is their general incompatibility with conventional film-forming ingredients. The recent introduction of hydroxyl-modified copolymers goes far towards overcoming this difficulty. In preparing these, sufficient vinyl alcohol to furnish 5-7% hydroxyl groups is added to the chloride-acetate mixture before polymerization. The resulting three-component copolymer is generally compatible with other resins such as conventional alkyds.

While, as indicated, the vinyl-copolymer resins are far from perfect, they represent a new and extremely useful class of film-forming materials. Most of the disadvantages of these products can be more or less completely overcome by methods previously indicated, and improved resins and improved methods of formulation appear at such frequent intervals that important further advances may be anticipated in the future.

ETHER RESINS

By the interaction of a phenol with epichlorohydrin (derived from propylene) followed by modification with a fatty oil a series of extremely interesting resins containing ether groups result. Glycerol dichlorohydrins may be substituted for the epichlorohydrin; it is probable that the dichlorohydrins convert to epichlorohydrin before reacting with the phenol. Glycide may also be used but the reaction is then difficult to control.

The fundamental resin unit contains a free hydroxyl group and an epoxy end group. The resin molecules can react further with themselves through the epoxy group, this condensation producing a free hydroxyl group as usual. Also, the free hydroxyl group may be esterified by a fatty acid. When so modified even with oleic acid, the resulting resins exhibit excellent drying properties, and films prepared therefrom are equal to pure phenolics in hardness; adhesion; and soap, alkali, and water resistance. Ether resin films are generally slightly inferior to alkyd resin films in color retention and chalking properties.

The preparation of these resins is comparatively simple: The epichlorohydrin is added at reflux temperature to a solution of the sodium salt of the phenol containing a 2% excess of sodium hydroxide. (A greater excess of free alkali results in early gelation of the reaction mixture.) After the reaction has proceeded to the desired extent, an excess of acetic acid is added and the resin is washed with sodium acetate solution and is then isolated and oil-modified by usual methods.

Ether resins of this structure are not compatible with low-grade petroleum solvents—a disadvantage in that the user may encounter precipitation difficulties when thinning with mineral spirits or on cleaning brushes with the same solvent. However, mineral spirit compatibility can be achieved by suitably modifying the phenolic component of the reaction mixture.

These oil-modified ether resins are materials of great interest and potential value. The replacement of most of the ester linkages of conventional alkyds by ether linkages results in a film forming ingredient that exhibits extreme stability towards the hydrolytic agents that deteriorate or destroy alkyd resin films. It is not improbable that the future will show that these ether resins represent an advance comparable in importance to the development of the alkyd resin series.

How Much AIR CONDITIONING Do You Need in a Research Laboratory?

The question has both human and dollar connotations. Here are the cases for . . .

COMPLETE AIR CONDITIONING

by H. L. TRUMBULL, Assistant to Vice President—Research
The B. F. Goodrich Company, Brecksville, Ohio

STRANGE as it may seem, we designed complete air conditioning into the new Goodrich research center at Brecksville, Ohio, for reasons of economy.

After the plans were drawn we found that the building was going to cost more than was anticipated. In seeking ways to lower the cost we discovered that if we took out the windows we could bring the service lines up through the outer wall instead of through central corridor pipe-runs, which is the conventional way. These pipe-runs usually take up about three feet of space between stories. By bringing the services up the wall we were able to limit the vertical distance between stories to about twelve inches and save about 20% on the cubic content of the building.

We further discovered that windowless, air conditioned buildings permit other economies: You don't have to wash windows. Because there is less dust, our janitorial work is handled by half the crew we formerly used. Machines and instruments stay cleaner and need less maintenance. There is no more fingerprinting of precision parts in humid weather. Lost time due to sickness has fallen—we estimate it at three-fourths of what it was in the old non-air-conditioned laboratory building at Akron.

There is a general feeling of satisfaction in a well-lighted and well-ventilated building. Ventilation and lighting are so uniform that both technical personnel and office people can be given a better arrangement of working space with no stuffy, unlighted cubbyholes. After a year and a half we have had no reports of claustrophobia.

Here are some of the technical details of the air conditioning system at Brecksville:

There is no recirculation of air within the main research laboratory. There is a complete air change in all laboratories every 6½ minutes. For purposes of economy the conditioning of the air is a centralized operation, but each room and hood has its individual exhaust to the outdoors in order to achieve flexibility and balance within the system. Each room has its own thermostat, which provides temperature control on 20-ft. centers independent of the adjacent requirements, thus making both warm-blooded and cold-blooded people happy. In certain rooms special requirements such as constant temperature or constant humidity have been provided. The building has two rooms in which there is a complete air change every half minute.

In the main research laboratory there are possible locations for 104 hoods, 49 of which are now installed. In each 10′ x 26′ module, 400 cfm. of conditioned air (6½-min. cycle) goes through the module and combines with 800 cfm. of unconditioned make-up air entering the throat of the hood. This provides satisfactory hood ventilation for the laboratory.

All things considered, we like an air

Completely air-conditioned B. F. Goodrich research center at Brecksville, O., is windowless.

Service lines in walls instead of corridors saves 3 ft. between floors in Goodrich center.

Condensed from papers presented by the authors before the Industrial Research Institute, Inc., May, 1949.

conditioned laboratory. We have lived in both types, and when the laboratory is a new one and properly designed to take full advantage of complete conditioning, we believe both the installation and upkeep will pay for themselves.

LIMITED AIR CONDITIONING

by C. R. DOLMETSCH, Assistant to the Vice President
Celanese Corporation of America, New York, N. Y.

CELANESE CORP. has recently opened a new central research laboratory at Summit, N. J., which is not completely air conditioned.

The laboratory is housed in a two-story building which was originally a high school. It cost the taxpayers of Summit about $800,000 to build, but turned out to be a "white elephant" because it was poorly situated in relation to population. The property was sold to Celanese for about half the original cost and was remodeled into the present laboratory.

Total floor area of the building is about 54,000 sq. ft. There are 115 rooms, including a sizeable library and auditorium. Only 24 rooms are completely air conditioned. These air-conditioned rooms comprise about 13.6% of the floor area and are assigned to physical testing, photography, microscopy, micro-chemistry, and special film casting.

Why was more air conditioning not provided? Actually, it was never seriously considered, because we were dealing with an already constructed building. If you ask a ventilating engineer about installing complete air conditioning in an existing building, he treats you with the benevolent, solicitous attitude usually bestowed on the mentally infirm. It seems that you practically have to demolish the building, especially the interior, to put in the necessary ducts and piping.

What would we have done if we had built the laboratories from the ground up? I don't know. I think we might have installed a little more air conditioning, but not a great deal more.

In the first place, our central research laboratories are located in a northern latitude, where the oppressively hot, humid weather does not last long. Most of it usually occurs in August, when a large part of the staff is on vacation.

Second, our laboratories are located in a suburban area where the altitude is about 375 ft., and the air sufficiently clean for almost all laboratory purposes.

Third, less than half the space in the building is devoted to "bench-and-instrument" type of work. We might air-condition the library, the business offices, the small conference rooms, and the section leaders' offices, but still about 50% of the floor space, represented by corridors and stair wells, lavatories, shops, pilot plant, and storage rooms would be left without air conditioning.

Furthermore, we would do some real thinking about cost. Our engineers estimate that if Celanese had constructed the present building from the ground up and had put in air conditioning, the additional cost for air conditioning would have been around $275,000. That is 11% of the total. In our company, such an expenditure would have to be completely justified.

In my investigation of this subject I conducted an informal opinion poll among executives of 33 private research laboratories selected at random. The results show some interesting points of view.

No one said flatly that complete air conditioning is undesirable. In fact, I think it may be assumed that the great majority feel it *is* desirable. The objections to providing it resolve down mainly to cost—cost of installation, operation and maintenance—and practicability. The extreme views range from those who have air conditioning and point enthusiastically to what it will do for worker morale, efficiency and productivity, to those who "will have no truck with such nonsense."

This latter view is represented by a former director of research of a large chemical company, who expressed himself this way: "It's the man that counts. If he has the real stuff in him, he will get his research problem solved no matter how hot and stuffy the lab gets."

Another view was well expressed by the director of research of a well known food company: "My boys would rather have $20,000 in extra equipment for scientific use than to have that money spent for air conditioning."

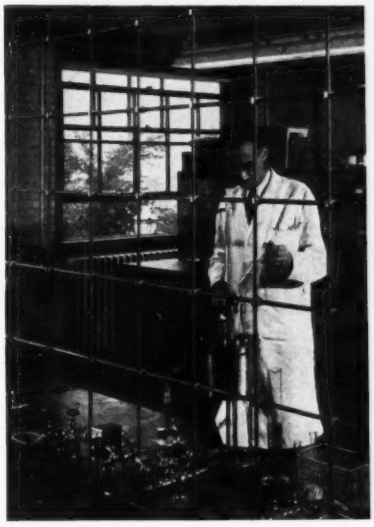
Of the 33 laboratories interrogated, 30% reported they had complete air conditioning. Of the 23 who do not have air conditioning, all but one reported they rejected it because of cost. In almost every instance, however, a number of specific factors entered into this cost decision. In order of frequency of mention, they were:

Geographical location. Most research laboratories are in northern states, where oppressively hot weather is of limited duration.

Nature of the research activity. A typical response, which was from a company in St. Louis, had this to say: "In our laboratory we have so much heat-producing equipment, such as electric ovens, muffles, steam baths, open flames, that it would pose a difficult problem to establish complete air conditioning. The practical solution seems to be to replace large volumes of this overheated air rather than resort to refrigeration." I think this sentiment is held rather widely because much chemical laboratory work involves just such heat-liberating operations.

Proximity to the company's plants and offices. Where the plants, offices and laboratories are at the same location, there is fear of provocation of envy in other employees which might result in the necessity of extending complete air conditioning to many other areas.

Physical layout of the laboratory. A number of laboratories either were built some years ago or were installed in an existing building not originally intended for the purpose. It would be extremely impractical to do the necessary interior dismantling and reconstruction to put in a central air conditioning system.



Celanese Corp.'s windows provide light, air.

In addition to the above, several more or less minor reasons were mentioned: fear of the health hazard that may be created by recirculating air that can be contaminated with noxious fumes; fear of excessive operating costs due to wastage of expensive conditioned air through laboratory hoods; fear that not everyone will be pleased with fixed conditions; fear of mental depression induced by working in windowless, artificially lighted rooms; fear of "coddling the long-haired boys."

This entire discussion seems to me to point up one thing: It is a mistake to generalize. The Celanese central research laboratory has under one roof many different operations. If we were to start from scratch, we might have a completely air conditioned building for the type of work that can be called basic, and we might have a separate building or buildings, more conventionally ventilated, for semi-works operations and for stores, shops, auditorium and cafeteria.

Reynolds Metals Co.

The high specific gravity of zircon is particularly useful in melting aluminum. Crucible spalls settle to the bottom instead of floating.

ZIRCONIUM
Widens Its Industrial Orbit

by WARREN B. BLUMENTHAL, Chief, Chemical Division
Titanium Alloy Manufacturing Division, National Lead Company, Niagara Falls, N. Y.

ZIRCONIUM HAS STEPPED OUT of the rare metals classification. About as abundant in the earth's crust as carbon, it is finding widening chemical uses in the textile, leather and pigments fields. Principal consumption, however, is in refractories, ceramics, and metallic alloys.

UNTIL recently zirconium has been regarded as a rare and obscure element. In fact, as late as 1946, it was classified as a rare metal,[5] although certain estimates[12] indicate it to be almost as abundant in the earth's crust as carbon.

The first push for use of zirconium came when zircon (zirconium silicate) became available in the United States as a by-product of the processing of titanium-bearing sands for the production of titanium pigments. Its first industrial use was an an opacifier for ceramic materials. Later came the application of zirconia as a refractory, to be followed by a multiplicity of uses of water-soluble zirconium salts. These uses include imparting water repellancy to textiles, tanning of hides, and preparation of lakes and toners for printing inks. More recently there have been indications that zirconium compounds may have an important place in medicine.

HISTORY

Zirconium was discovered in 1789 but its industrial exploitation did not occur until after World War I. During that war the Germans produced a zirconium-containing steel which was reported to be tougher than other steels then available and was used in armor plate.[13a] This encouraged extensive researches in zirconium alloys, and permanent usages of zirconium in steel, aluminum and magnesium have resulted.

Concurrent industrial use of titanium-bearing sands of Florida led to the separation of large quantities of zircon as a by-product. Titanium Alloy Manufacturing Company soon developed a zirconium dioxide ceramic opacifier which served initially as a substitute for the then scarce and expensive tin dioxide. The new product, "Opax," contained 90% zirconium dioxide. About ten years later, another opacifier, "Zirox," consisting of 98.5% zirconium dioxide, was first offered to the ceramic industry.

Zircon, too, was found to be excellent for use in frits to produce opacity, replacing antimony oxide for this purpose. Conversion of zircon to double silicates of zirconium and certain elements of Groups I and II formed products particularly useful in ceramic glazes and zircon porcelains.

The researches during World War I developed industrial methods for producing soluble salts of zirconium, such as chlorides, sulfates and acetates. However, a sizable demand for these salts did not arise for several decades. A flurry of interest in zirconium salts for use in silk weighting occurred in the late twenties. This soon subsided due to changes in fashions in silks.[7] During the thirties, there was a great growth of the zirconium ceramic industry and the beginnings of the growth of a stable zirconium chemical industry. Both had assumed considerable importance by the end of World War II, though sales of zirconium chemicals were only a small fraction of those of ceramic products.

PRODUCTION

World production of zirconium concentrates in 1946 was 25,000 short tons.[4] Of this, 6400 tons were obtained from a 50 mile stretch of Australian beach between Byron Bay, New South Wales, and Southport, Queensland. American imports of zircon (zirconium silicate) were almost entirely from this source, while baddeleyite (zirconium dioxide) was imported entirely from Brazil, the latter country being the only important source of this mineral. Zircon was also produced from the Malabar coast, Travancore, India, Mariupol, Ukraine, U.S.S.R., and Malaya. (India was once the chief source of American imports.)

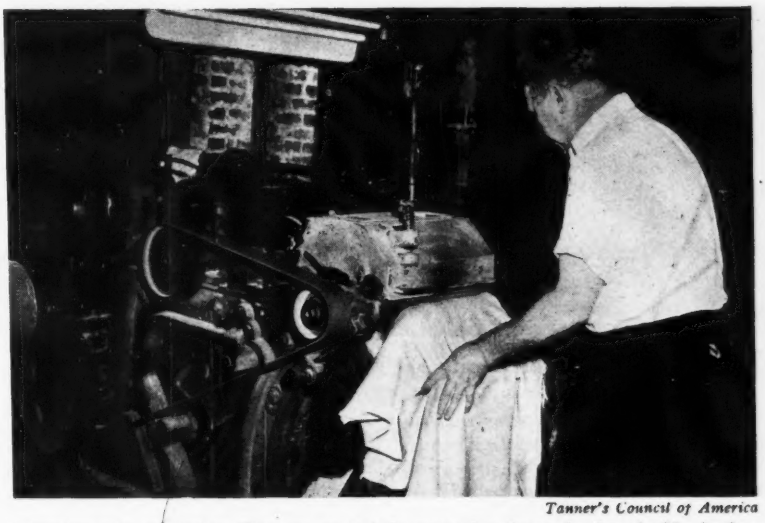
The entire production of zircon in the United States during recent years has been in Florida. Mining of zircon in that state has been on a large scale only since the beginning of World War II, but in 1948 it was estimated to total over 12,000 tons. The larger part of the mining operations was near South Jacksonville, but other operations were undertaken near Vero Beach.

Shipment of zircon to American consumers totaled 20,555 tons. Distribution of uses, according to the estimates of shippers, was:

Refractories	28%
Vitreous enamels	25%
Electric and chemical porcelains	19%
Metals and alloys	16%
Pottery glazes	10%
Miscellaneous	2%
	100%

Foreign consumption of zirconium products has been relatively small.

Zircon sands, as mined, consist substantially of a mixture of zircon, rutile, ilmenite and quartz. The components are first separated by hydraulic methods and then by electrostatic and electro-magnetic separators. The product is the zircon of commerce, and contains about 98-99.5% of zirconium silicate. Zircon of higher purity is prepared for certain uses by washing the mechanically purified product with acid and calcining it.



Tanner's Council of America

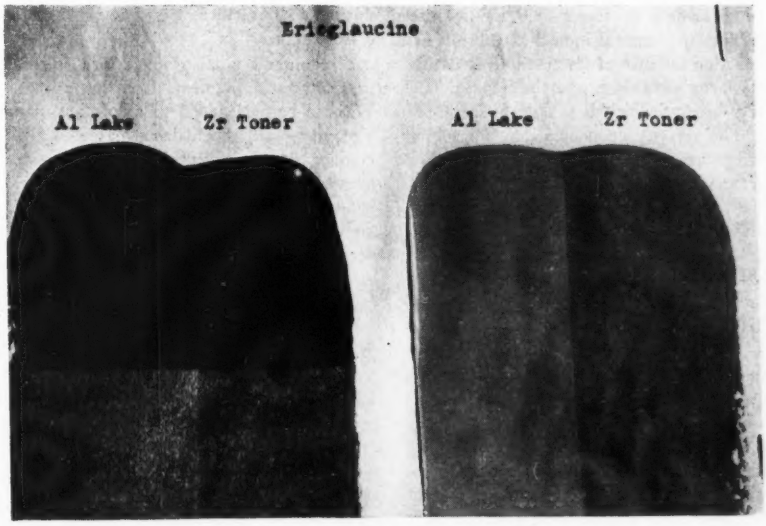
Zirconium salts tan leather. They are particularly outstanding for production of white leather.

To prepare zirconium oxide and zirconium chemicals, the zircon is commonly heated in an arc furnace with carbon. The silica content vaporizes and the zirconium combines chemically with the carbon. If an excess of carbon is used, the product is zirconium carbide, while if a deficiency is used, a product called "zirconium cyanonitride" is obtained. Both of these compounds can be burned in air to form zirconium oxide, or burned in chlorine to form zirconium tetrachloride. When zirconium tetrachloride is added to water, it decomposes and forms the soluble salt, zirconium oxychloride. The salt is of industrial importance in itself and is an intermediate in the preparation of other useful compounds, such as the hydrous oxide, acetates, sulfates and nitrates.

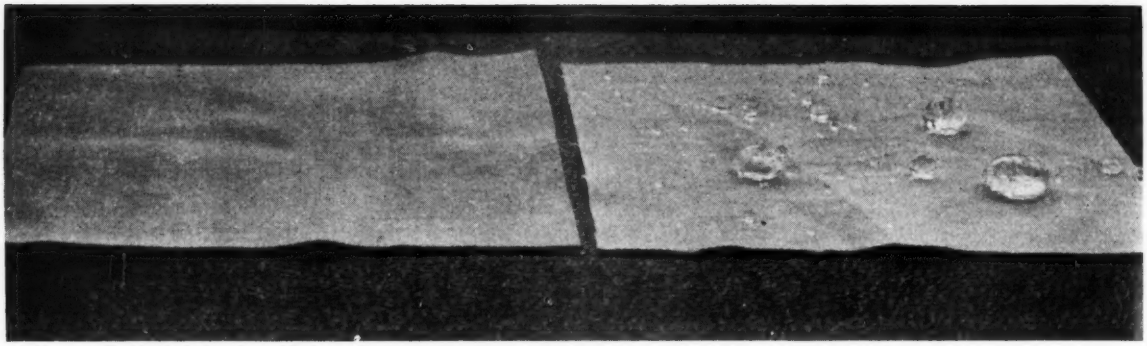
USES

The ceramic uses of zircon and zirconia arise from their high reflectivity of light, high melting point and thermal stability, chemical inertness (particularly of zircon) and high specific gravity. Because of their high reflectivity these substances are used extensively as opacifiers in ceramic enamels and glazes, while their high melting point and thermal stability make them valuable refractories. They are used not only in crucibles, furnace construction and insulation for electric heating elements, but more recently it has been used in jet engine nozzles.

Some of the more important applica-



Comparison of zirconium toner and aluminum hydrate lake of erioglaucine. Full strength at left, equally extended with zinc oxide at right.



Certain zirconium salt solutions impart a high degree of water repellence to cloth which is dipped in the solution, wrung out and dried.

tions are melting aluminum, production of metaphosphates, smelting of glass and of raw mixtures for enamel and glaze frits, ramming mixtures in induction furnaces, and furnace blocks. In the melting of aluminum, the resistance of the zircon to being wetted by the molten aluminum is the primary advantage. About 3000 tons of zircon was used in foundry molds and cores during 1948. Chemical inertness is an additional asset in the uses already enumerated and lends itself to the construction of equipment where extreme resistance to chemical action is required. An example is in the construction of rotary calciners where acidic materials must be handled. The high specific gravity of zircon is particularly useful in crucibles for the melting of aluminum, because spalls and fragments of the crucible material settle to the bottom instead of floating in it.[1]

Until recently zirconia refractories suffered from lack of resistance to thermal shock due to a change in crystalline form at about 1000° C. Now thermal shock stability has been achieved by addition of small quantities of lime and magnesia (*CI, Dec. 1947, p. 978*).

The very complexity of the chemistry of zirconium is responsible for its usefulness in chemical industry, where it can function because of its amphoteric nature, its large covalency, and the unusual variety of ions which it is able to form.

The largest consumption of soluble zirconium compounds is to render textiles water-repellent. This use depends on the affinity of zirconium for textile fibers and its property of forming hydrophobic (water-repellent) soaps with fatty acids. Merely dipping a fabric into a solution of a zirconium compound, wringing and drying, gives a certain amount of water-repellency. Water applied to a surface of the fabric will generally not soak through, even though the porosity of the fabric is unchanged. Zirconium adheres to the fibers even after rinsing with water or laundering with soap and water. With a solution of certain zirconium salts, containing a soluble fatty acid anion, a very high quality of water-repellence is imparted to a cloth which is dipped in the solution, wrung out and dried. After this treatment, the fabric not only shows no tendency to absorb water, but sheds water from the exposed surfaces. This quality may be further enhanced by mixing a wax emulsion with the solution of zirconium and fatty acid. Zirconyl acetate, a mildly acidic salt, has been most widely used. More recently, a mildly alkaline salt, ammonium zirconyl carbonate, has been introduced for this purpose.[14]

The second largest use of zirconium salts in 1948 was manufacture of pigments, a post-World War II development. Zirconium is a precipitant for acid dyestuffs, and, when properly controlled, colored pigments of excellent general properties and outstanding tinctorial strength are obtained.[2] These pigments are particularly suitable for printing inks, where their high strength permits more brilliant color effects than were previously obtainable with similar shades of lake pigments. The ability of certain zirconium salts to precipitate acid dyes has also improved the lake pigments. Earlier pigments often bled in water, leading to smudging during lithographing and in handling after the printing. Addition of zirconium salts to some of these lakes during manufacture has alleviated this disadvantage.

Zirconium has also found use in the preparation of pigments from basic dyes. When a base is added to a solution of a zirconium salt, the hydrous oxide of zirconium is precipitated. This oxide usually carries a positive electric charge, but treatment with certain salts (citrates, tartrates, salicylates, etc.), produces a negative charge. The coloring principle of a basic dye is an electropositive radical or cation. When a basic dye solution, such as methyl violet, is added to a slurry of the electronegative zirconium oxide, an intensely colored solid forms. Filtration, washing and drying produces a strong, soft pigment.[3] However, it has poor fastness to light and bleeds in water. New pigments of this type have been developed by several pigment manufacturers, and it is thought that one or more of them will be offered to the market.

Zirconium salts tan leather. Such tannage has been extensively studied by scientists of the Rohm & Haas Co. The sulfate has been found most satisfactory and leathers prepared with this agent were of good strength, withstood exposure to light and hot water, and were outstanding in stability and washability. It is thought that the tanning is accomplished by a zirconyl sulfate anion, $ZrO(SO_4)_2^=$, probably by linking together electrovalently two amino groups of the leather protein.[11]

Other present or prospective uses of zirconium chemicals are in the mordanting of textiles, preparing incandescent gas mantles, catalyzing organic syntheses and hydrocarbon cracking, and in medicine. While little has been published yet on the medical uses of zirconium, a number of laboratories have obtained encouraging results. Zirconium compounds show particular promise as radio-opaque materials for use in X-ray and fluorescent diagnosis, while some of the salts exhibit value for certain afflictions of the skin.

ACKNOWLEDGEMENTS

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How to Avoid Waste Research

by J. BENNETT HILL*
Sun Oil Co., Marcus Hook, Pa.

FRANK ACCEPTANCE OF INDUSTRIAL RESEARCH as a profit-making proposition and a broad-minded approach tempered with realistic evaluation will keep results within the bounds of the company's objectives.

IN considering any industrial research program it must be constantly kept in mind that there is one and only one object of industrial research: to make money for the company. Anyone who objects to the sordidness of this approach should reconsider the facts of life.

The profit motive may, of course, be direct or indirect: It may look directly to new profitable business for the company; it may seek to protect the company's position from obsolescence in one of its forms; it may aim to guard the company against damaging losses; or it may seek to increase the enthusiasm and thereby the efficacy of the research workers. But in any event the motive is the same.

The general scope of the research program should be defined in terms of the company's field of interest. It would be an excellent thing if this could be done by the top executives of the company; but in any event their advice should be carefully sought, both as to original definition and any review of it. It is not only fruitless but actually harmful to the morale of the research department to do a good research job on some subject that later appears to be outside the company's field of interest.

This doesn't mean, however, that the research directors should be slavishly bound to any such definitions. On the other hand, it is frequently their job to convince top management that some field not included in the definition is a proper and profitable one for the company, and some excursion into a debated field is often advisable. It is obvious that in such cases the research director shoulders the responsibility and that it is up to him to see that he does not make too many mistakes.

Within the defined field the program should know where it is going. Bypaths are usually attractive, and the temptation is great to run along them. They may be worthwhile but, if so, they should be thoroughly appraised before setting up a new objective. Furthermore, there should not be too many objectives. The small laboratory particularly must realize that it cannot pursue as many lines of work as can its large competitors. If it tries to cover everything, it will cover nothing. It must instead pick the lines which appear to offer the greatest promise of returns, and make up its mind that it will let someone else do the others.

* Director of Chemical and Engineering Division, Research and Development Department.

ENCOURAGE IDEAS

It is a symptom of a healthy laboratory to have too many ideas for research projects. If this is not the case, and if the laboratory management finds itself constantly scratching for projects, there is something wrong somewhere, and the directors should find out what it is. Maybe

"The small laboratory . . . must realize that it cannot pursue as many lines of work as can its larger competitors."

it is the director himself, maybe it is a feeling among the researchers that they are not supposed to have ideas or that their ideas are not appreciated, maybe it is a lack of confidence of other departments in the research department—but in any case the cause should be found and corrected, even if a major operation is required.

The ideas for research investigations come from many sources; probably the most prolific is the laboratory itself. This is borne out by a survey conducted and reported by C. G. Harrel,[1] the data from which show that the research department is the origin of 44.7% of all accepted research projects.

If ideas don't voluntarily come from other departments, a lack of proper contact is indicated; and the research department should take the initiative in ferreting them out until contacts are good enough so that they come without calling. The fear of a research department that it will be swamped by requests from other departments and the consequent avoidance of opportunities for such requests is distinctly unhealthy. It is also short-sighted, since, in obtaining the support of the company, the research department needs the confidence and support of each individual department. The better plan is to encourage the requests, and, if any cannot or should not be met, to sit down with the other department and explain in perfect frankness why not.

PROJECT SELECTION

If there are more ideas for worthwhile projects than men to work on them, it is necessary to select those projects which will make up the research program. This is fundamentally the job of the research director. Some directors take this responsibility wholly upon themselves and dictate their programs. Others go to the other extreme and set up a committee to vote on projects. The wisest course, at least in most organizations, is probably somewhere between these two. The director needs all the information and all the advice he can get, not only from his associates, but from other departments as well. He may seek this advice quite informally, or he may set up an advisory committee (not an executive committee) to discuss individual projects before they are included in the program. Such an advisory committee would meet at regular intervals, both to consider new projects and to review existing ones. It may include representatives of other departments as regular members. Since such inclusion may involve difficulties at times, a better plan is probably to invite such representatives to special meetings, which should not, however, be held too infrequently. In any event, too formal a scheme and too much red tape must be avoided.

Before discussing the basis of selection of projects, it is necessary to consider briefly types of projects. Practically all projects proposed will fall into one of the following classes:

1. New products
2. New and improved processes
3. Improvement of existing products
4. Improvement of existing processes (including safety)
5. Technical service to manufacturing, sales legal, etc.

[1] *Research in Industry* (D. Van Nostrand Co.) p. 122.

6. Development of better research tools, both equipment and information
7. Keeping the organization's professional fences in repair

Each research organization will probably wish to maintain some kind of a balance between these classes, although the proportionate balance will vary widely depending on the nature of the business and also of the research organization. New products cannot be emphasized to the exclusion of further development of existing products or vice versa.

Some organizations are not responsible for technical service to other departments but probably most are. This is a valuable function both ways: The research man on account of his intimate familiarity with the newest developments, both inside and outside his laboratory, is able to bring to the solution of such problems a skill and knowledge which the non-specialist does not have; at the same time, the research department, through the medium of technical service, is able to keep in much closer contact with the problems of the manufacturng and sales departments than it otherwise would. For those organizations who perform technical service, the proportion of man-days expended on technical service to total man-days seems to average about 30-35%.

In most of the above classifications the proposed project may be either short-term or long-term, and again between these two types a balance must be set up and maintained. A laboratory which overemphasizes short-term projects will make a better showing for a time, but will eventually be found to have "missed the boat." Harrel's survey, referred to above, shows that average practice balances short-term against long-term in a ratio of about 0.8:1.

EVALUATION

The acceptance of an individual project as a part of the research program naturally involves consideration as to whether it fits in with the general objectives of the program, and also a consideration of the balances mentioned above. The justification, however, which has to be most carefully studied is based on its value to the company if successful, and its probability of success. This has been frequently expressed by an index:

$$\frac{\text{potential profit} \times \text{probability of success}}{\text{cost of research}}$$

This index sounds simple but, as a matter of fact, it is so complicated that it is almost impossible to work out numerical values and so use the index in any absolute way. The factors which make it up are, however, used in any evaluation either consciously or unconsciously. All three items are difficult to estimate: The potential profit requires discussion with the department to which the reasearch is applicable; the cost of the research and the probability of success can be best evaluated on the basis of literature study and a certain amount of exploratory work on the validity of the idea. These steps should precede any final action on acceptance of the project or on assignment of priority above or below other projects.

Where the research director meets with an advisory committee to discuss research projects it is helpful for each member to see before the meeting a formal application for each project to be considered. This should state what the research hopes to accomplish, should estimate the cost of the research and its completion date, should discuss the value of the work if successful and its probability of success, and should outline in general terms the proposed method of attack. Such a statement gives a basis for a full discussion and final decision.

"No project should be turned down without giving its proponent a chance to present his case directly."

Whether or not such an advisory committee is functioning, no project should be turned down without giving its proponent a chance to present his case directly. The responsibility of presenting it should not be left to a supervisor who almost certainly will lack some of the original author's enthusiasm.

After the research program is established, the usual course is to tear it apart again. However necessary the program may be, it should not be regarded as immutable, but should be altered, after careful consideration, as occasion demands. Particularly, it should not interfere with exploratory work on new ideas. Often a man with the germ of a good idea is hesitant to formalize it even so far as to obtain permission from his superior to try it out.

Fortunately, most organizations recognize this and adopt a liberal policy in regard to permitting their research men to spend some portion of their time on such work. Where a formal project budget exists, a definite amount of every research chemist's time is frequently allotted to him, without accounting, for such exploratory work as he pleases. This proportion is usually about 10%, but some laboratories allow as high as 20%. Those who use this plan agree that it bears fruit.

DROP WHEN INDICATED

Frequent review of research projects approved and under way must be a part of any administration of the research program. This should not be too frequent and need not necessarily be at stated intervals. Review may be called for by the research man, by the director, or by someone else possible in another department, who is interested in the project.

There is always a hesitancy to drop a project, but the department should be courageous enough to face the situation and cancel the project if it no longer offers sufficient promise for continuance. In such an event, considerable pains should be taken to point out the reasons, not only to the research man who heads the project, but also to his research assistants, and to convince them of the wisdom of the decision. Nothing takes the heart out of a man more than the feeling that his work has been arbitrarily and unwisely stopped before it is finished.

It may seem superfluous to mention that no project, whether completed or dropped, should be closed out until the report is written; but in allocating time to projects it is not too uncommon that this item gets forgotten, and the man or team is assigned another job on the tacit supposition that the report will somehow, some day, get written. At the risk of being trite, it is well to point out again that work not reported properly and adequately represents so much of the company's money thrown away.

V-C elemental PHOSPHORUS

VIRGINIA-CAROLINA CHEMICAL CORPORATION has doubled its capacity to produce elemental phosphorus by the electric furnace process at Nichols, Florida, and construction of new V-C furnace operations at Charleston, South Carolina, will be completed in the spring of 1950.

These enlarged production facilities, together with V-C's major raw material resources, assure a greatly increased output of V-C Phosphorus to meet the growing demand for this basic chemical.

The purity of V-C Phosphorus surpasses all known specifications for this product. V-C Phosphorus is available for shipment in tank cars . . . or in steel drums for shipment by rail or water.

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Recent Products from the A & S Packaging Laboratory

SHUR-CLOSE VALVE—Tests made in plants all over the country have proved that SHUR-CLOSE valve bags insure less dusting when packing and less sifting when packed. Consumers are requesting shipments in SHUR-CLOSE valve bags because they prevent waste; while operating men in packing rooms claim SHUR-CLOSE bags eliminate objectionable dust.

STA-STAK BAG—It's the specially designed outer creped sheet that does the trick. STA-STAK creped paper takes the skid and slip out of piling, stacking and palletizing. The STA-STAK construction gives greater resiliency to withstand shocks and general abuse better than ordinary multiwall bags. And they handle easier . . . the crinkly surface provides a handhold that workmen appreciate.

SUPER-GLOSS FLOUR BAG—The SUPER-GLOSS flour bag was developed by the A&S packaging laboratory with the help of the country's largest mills: The long fibered white kraft sheet combined with a blue kraft liner makes the toughest 25 lb. flour bag on the market. The SUPER-GLOSS clay coated sheet gives this bag exceptional whiteness and keeps ink on the surface, producing a sparkling, appealing shelf package.

ARK-TONE PRINTING—A&S has also perfected developments kindred to the field of paper bag making. The new A&S ARK-TONE PRINTING is a case in point. No other commercial bag printing can touch this ARK-TONE process for printing fidelity. Users report increased sales of ARK-TONE printed bags because strong, sharp, clear colors give package greater shelf appeal. ARK-TONE process printing is the only type of commercial bag printing to combine product reproduction and color brightness.

PLASTO-PAK BAG—This is the very latest development from the A&S packaging laboratory. PLASTO-PAK bags have a polyethylene kraft liner which affords completely moisture-proof protection to hygroscopic materials. Many acids and other strong chemicals, when packed in the PLASTO-PAK bag fail to attack the liner. A special "Electro-Seal" (patent applied for) closes off the needle holes at the bottom of the bag . . . no other multiwall has this feature.

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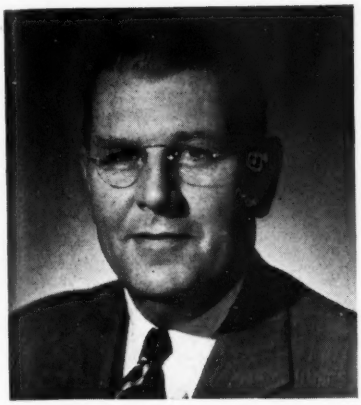
THE CHEMICAL PANORAMA

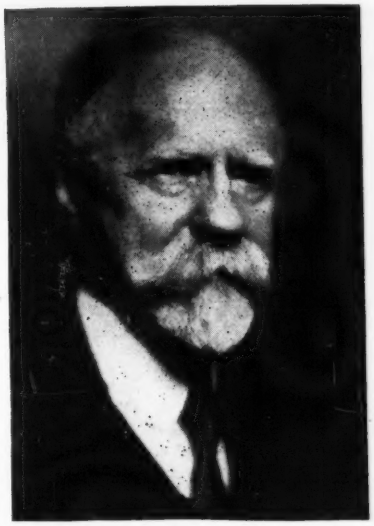
NEWS OF THE CHEMICAL PROCESS INDUSTRIES IN PICTURES

PEOPLE



H. R. SALISBURY, named president, Air Reduction Sales Co. He has been with the company 23 years in various executive capacities.

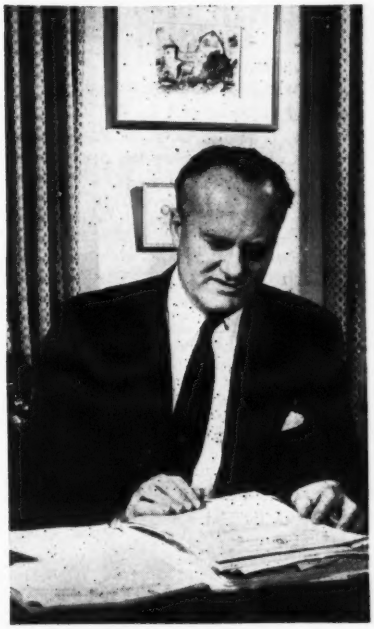
MARION W. SMITH, a vice president and director, Vick Chemical Co., elected president and general manager, J. T. Baker Chemical Co.



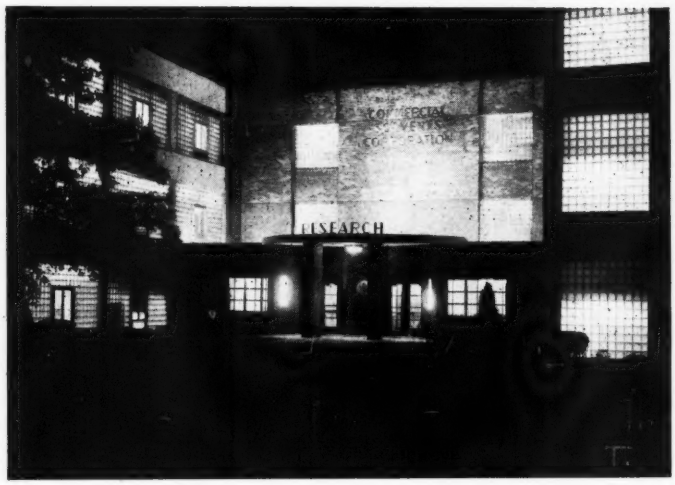
WILLIAM B. BELL, president, American Cyanamid Co., who has received the Society of Chemical Industry Chemical Industry Medal

NICOL H. SMITH, named director of research operations, The Franklin Institute Laboratories for Research and Development. He was director of chemical engineering and physics.

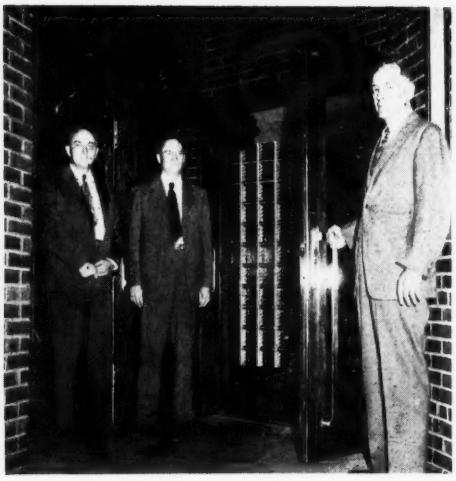
ROGER S. WARNER, who has joined Arthur D. Little, Inc. He was formerly director of engineering for the Atomic Energy Commission, in charge of its postwar construction program.



RALPH L. EVANS, president of Evans Chemetics, Inc., will receive the 1949 Medal Award of the Society of Cosmetic Chemists, Dec. 8.



Entrance to Commercial Solvents main research building. The laboratories are dedicated to T. P. Walker, chairman of the board, and were opened by Harry E. Perry.



L. to r., T. S. Carswell, vice president; Jerome Martin, director of research; and Harry E. Perry, president.

New Facilities for Pharmaceuticals

A $2,000,000 addition to its research center which more than doubles previous facilities has been put into operation by Commercial Solvents Corp. at Terre Haute, Indiana. A large portion of the new facilities will be devoted to studies of antibiotics and other pharmaceuticals.

The original research building has been altered to supply added working area by the addition of a wing which contains laboratories, office space, instrument rooms, work shop and service units.

A new two-story bacteriological pilot plant has been completed. Six 1,500-gal. fermenters with cookers and coolers, and six 400-gal. fermenters have been installed, together with air sterilizing equipment and other essential apparatus. Provision has also been made for anaerobic fermentation equipment. A control lab, as well as processing area and equipment and finishing rooms, for products of a nature requiring sterile handling are included.

Another building of the group is a pharmacological lab which contains laboratories, animal rooms and runs outside the building.

Chemistry in Whaling

The whaling industry's challenge to chemistry is being met in the factory of Western Whaling Corp., Coal Harbor, British Columbia, where the firm is utilizing virtually 90% of the world's largest animal, principally through chemical processes which result in by-products. The firm, organized in 1947, is conducting the only such venture in the North Pacific, and marks the return of whaling to those waters for the first time since 1941.

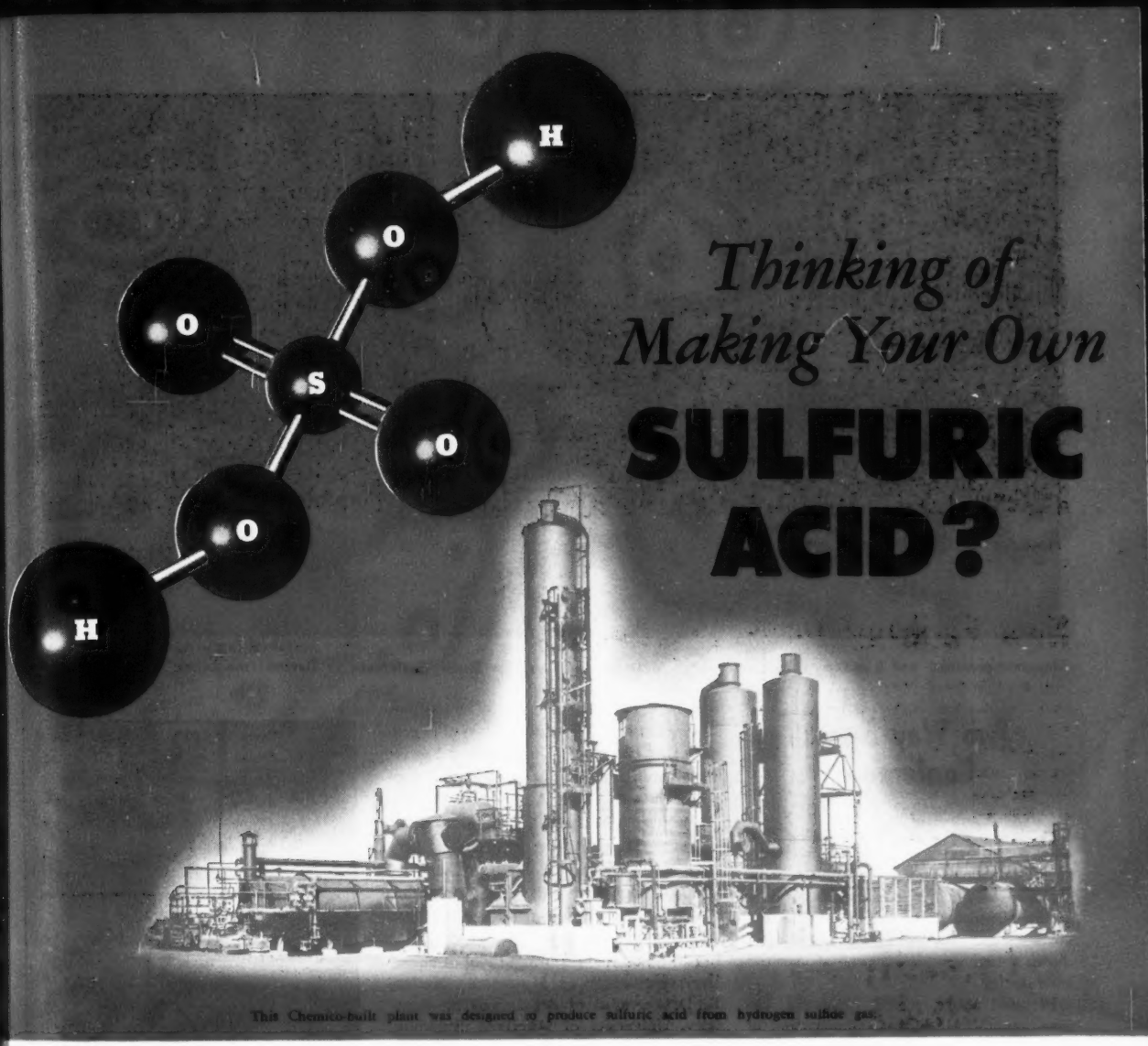
The company not only has pioneered new methods, but is continuing its research with a view to reclaiming additional products of pharmaceutical value.

At present the chief products derived are oil, soluble solids for livestock and poultry feed, Vitamin A-bearing oil, feed meal for cattle and poultry, and meat for dog food.

A unique process is applied to the whale livers in order to obtain the concentrated vitamin oil. Livers are ground into a mild solution of alkali and the vitamins extracted by introducing a highly refined herring oil. The vitamin-bearing oil then is separated from waste liquor and water by repeated introduction into centrifuges. The finished oil carries a potency of up to 300,000 units per gram, and 3,000 lbs. of liver are processed daily.

Flensers are about to go to work on a humpback whale. In background is a quadruple-effect evaporating plant which produces half-solid livestock and poultry feed from whale solubles.

At the moment, research workers are exploring the possibility of extracting insulin from the whale's pancreas along with prospects of obtaining hormones for pharmaceutical purposes.



Thinking of Making Your Own SULFURIC ACID?

This Chemico-built plant was designed to produce sulfuric acid from hydrogen sulfide gas.

Many users find it economical to buy sulfuric acid in drums or in tank cars. Others—who need larger quantities—produce their own more profitably. If you have been contemplating the expansion of your present facilities or the erection of a new plant for the manufacture of sulfuric acid, consider these facts about Chemico-built contact acid plants.

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HIGH CONVERSION—The high production rate and low operating costs of Chemico plants are largely due to the well-designed converters and the use of the highly effective, non-poisonable Vanadium Catalyst.

These cost-reducing design features are only a few of the outstanding benefits of Chemico-built sulfuric acid plants. They may point the way to vital savings in fulfilling your acid needs. But before deciding whether it would be sound business to produce your own sulfuric acid, discuss your specific problems with Chemico.

AN INTERESTING BULLETIN S-101—gives you additional information on Chemico Sulfuric Acid Plants. Write for your copy today.

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Chemico Plants are Profitable Investments

November, 1949

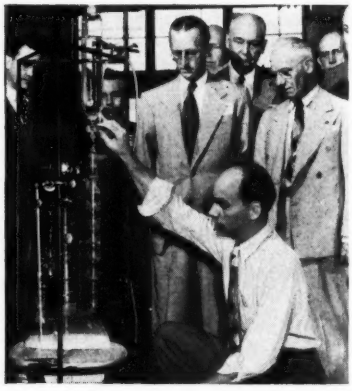
CC-191
737

Monsanto personnel and 8 university professors invited to attend the Two Way Street Conference at Dayton (see below for identification).

Two Way Street Conference

Monsanto Chemical Co. recently arranged a Two Way Street Conference with professors from various universities at its Dayton, Ohio, plant to encourage exchange of ideas between academic men in the chemical field and those working in industrial plants. The visitors were shown methods used in Monsanto's laboratories.

Pictured above, seated, reading clockwise, are: N. H. Furman, department of chemistry, Princeton; John C. Bailar, Jr., professor of chemistry, University of Illinois; George W. Cannon, associate professor of chemistry, University of Massachusetts; George W. Watt, professor of chemistry, University of Texas; R. F. McCoole, Monsanto's technical personnel manager; C. A. Hochwalt, Monsanto vice president; W. K. Menke, director of Monsanto's general development department; Raymond M. Fuoss, department of chemistry, Yale; C. S. Hamilton, chairman, department of chemistry and chemical engineering, University of Nebraska; Lee Irvin Smith, school of chemistry, University of Minnesota; Nathan L. Drake, head of department of chemistry, University of Maryland. Standing, l. to r., H. K. Nason, E. N. Rosenquist, Prescott Sandidge, I. B. Johns, E. W. Gluesenkamp and R. W. Sudhoff, all of Monsanto.



Joseph Fields, chemist, of the Polymer Research Group, conducts a polymerization reaction.

Marathon Opens New Lab

Marathon Corp. has opened a new Central Research Laboratory at Rothschild, Wisconsin, for both fundamental and applied research, particularly on wood, pulp, paper and lignin products.

On the first floor of the three-story building is the constant temperature and humidity room, a machine shop, storage facilities and two pilot plants, one of which is two floors high. The second, or main floor contains the conference room, library offices and two laboratories. The third floor is occupied almost entirely by laboratories.

Marathon's new lab, of structural steel, reinforced concrete and brick, with Indiana limestone trim. Windows are hermetically sealed double glass as the building is air conditioned.

For Light Color Alkyds!

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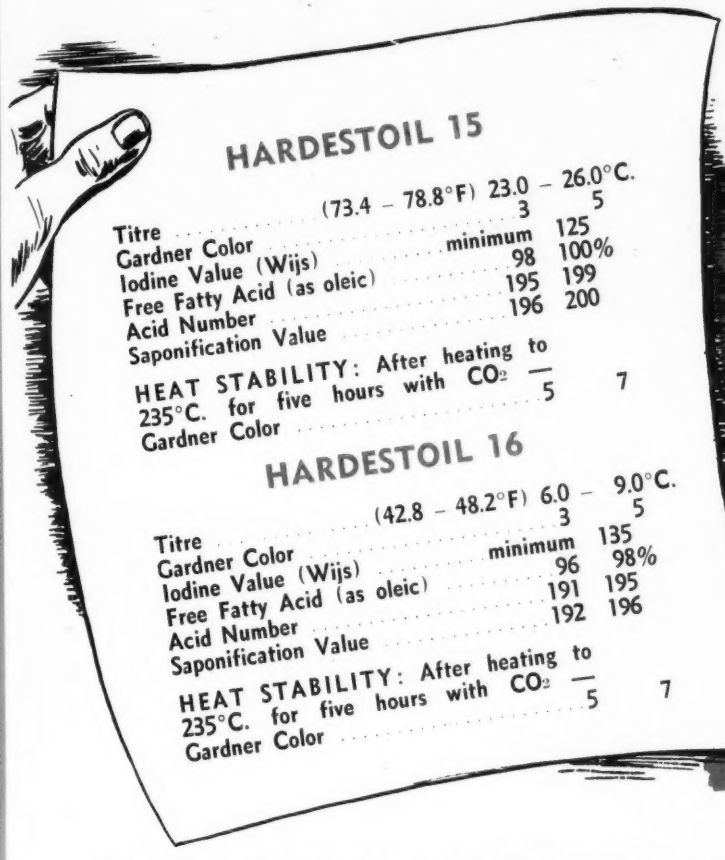

HARDESTOIL 15

Titre	(73.4 – 78.8°F) 23.0 – 26.0°C.	
Gardner Color	3	5
Iodine Value (Wijs)	minimum	125
Free Fatty Acid (as oleic)	98	100%
Acid Number	195	199
Saponification Value	196	200
HEAT STABILITY: After heating to 235°C. for five hours with CO_2 — Gardner Color	5	7

HARDESTOIL 16

Titre	(42.8 – 48.2°F) 6.0 –	9.0°C.
Gardner Color	3	5
Iodine Value (Wijs)	minimum	135
Free Fatty Acid (as oleic)	96	98%
Acid Number	191	195
Saponification Value	192	196
HEAT STABILITY: After heating to 235°C. for five hours with CO_2 — Gardner Color	5	7

2

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Atlas Dedicates New Lab

Part of the staff of the Atlas Laboratories. Front row, l. to r., G. Gabriel, J. Dahle and J. Fry. Second row, C. DeLong, W. Lantz, W. Pascoe, W. Rutter, C. Reinert and C. Romig.

The Atlas Research Laboratories were recently dedicated at Mertztown, Pa., as a memorial to the late Maximillian F. Wirtz, who founded the firm in 1892. The ceremony was featured by the unveiling of a plaque in memory of the founder by his widow, Bernardine Wirtz Dorr.

Joseph A. Snook, general chairman of activities, opened the laboratories for inspection by the employees and their families. They are housed in a two-story brick building with over 5,000 sq. ft. of floor space. The unit laboratories are 15′ x 15′ and one chemist and one assistant is assigned to each. A modern library with over 2,000 technical volumes occupies part of the second floor.

The laboratories are staffed by twelve chemists and technicians under the direction of Raymond B. Seymour, technical director, and Joseph Dahle, research director. The control laboratories now occupy a building in the plant area formerly used for both research and control.

Torchlighters Chorus

Members of the research staff, Whiting Laboratories, Standard Oil Co. (Indiana), have organized the Torchlighters chorus. Since the first of March this year the chorus has given several programs for local organizations and charity concerts in Indiana and Michigan. Director of the chorus is J. P. Jones, right, and accompanist is Patricia R. Neesley, wife of a chorus member.

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CHEMICAL SPECIALTIES

Metal Polish Formulations

by Cornelia T. Snell
Foster D. Snell, Inc., New York, N. Y.

FUNDAMENTALLY a dispersion of an abrasive in a liquid, metal polish is easily added to a specialty line, enjoys a steady demand.

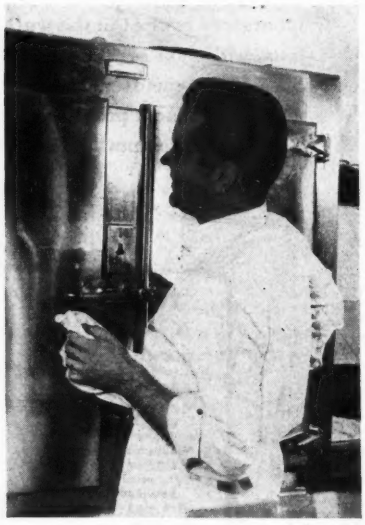
CHEMICAL SPECIALTIES manufacturers find metal polishes profitable products that are in steady demand by users of janitor supplies, industrial consumers and the retail trade. They are relatively easy to make since for the most part only simple mixing and filling equipment is needed. Moreover, they are a natural addition to the line of a manufacturer who is making other types of polish for he already has most of the raw materials in stock.

Metal polishes remove the coating of tarnish and soil that dulls the natural beauty and luster of a metal. Tarnish is formed by reaction of the metal with substances in the atmosphere, and in most cases results in the formation of oxides. Even metals which are highly resistant to corrosion such as stainless steel undergo some degree of tarnishing, although relatively little in comparison with brass. All metals, particularly those used for automobile trim and other outdoor decorative effects, acquire a more or less oily film of soil. In designing a polish for corrosion-resistant metals, emphasis is on cleaning action; for metals more readily attacked by the elements and compounds present in a moist atmosphere, on polishing action.

A study of the wetting of metal surfaces shows that clean, unrusted steel is organophilic, or preferentially wet by organic solvents, but rusted steel is hydrophilic, or preferentially wet by water.[1] This is probably true for the tarnish which forms on other metals.

PROPERTIES AND COMPOSITION

The desirable properties which a polish should have include the following: (1) It should remove both soil and tarnish without damaging the metal; (2) it should be of a consistency easy to apply without excessive waste; (3) it should give a high luster with a minimum of rubbing; (4) it should leave the surface with a light protective film which tends to prevent immediate corrosion; and (5) solid matter should not cake out during storage.



Demand for shiny metal surfaces insures good industrial and retail market for polishes.

Metal polish consists essentially of an abrasive dispersed in a liquid medium. The abrasive varies according to the metal to be cleaned. The liquid may be an organic solvent, or may be made with a water base. The disadvantage of the former is its flammability, which restricts its sale in some localities. However, a small amount of solvent is sometimes present to help dissolve the greasy matter in soil. Solvents which have been used as a base include white spirit, kerosene, naphtha, and light mineral oil. Small proportions of such liquids as carbon tetrachloride, methylcyclohexanol, ortho-dichlorobenzene, and methanol are sometimes introduced in water-base polishes. Aluminum naphthenate may be incorporated to increase viscosity. Soap is the commonly used cleaning and dispersing agent.

Chemical cleaners may also be present, such as ammonia which cleans copper by forming soluble ammonium complexes with compounds present in the tarnish. In the past oxalic acid was much used as a cleaning agent; this also reacts chemically with tarnish ingredients. It is not very popular now because of its toxicity and also because an excess remaining on a metal would itself cause corrosion. Salts of oxalic acid are preferable to the free acid as chemical cleaning agents.

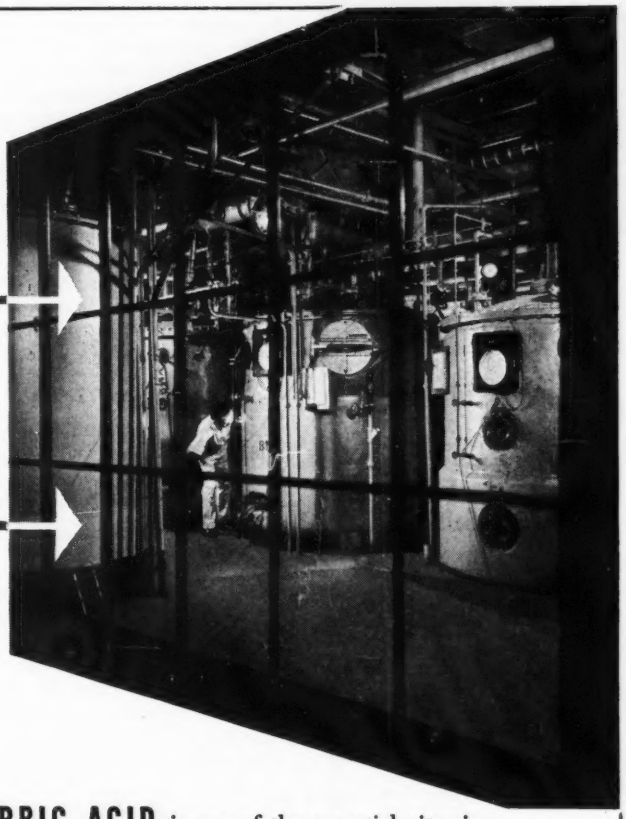
The hardness of abrasives with respect to that of the metal must be considered.[2] The accompanying table shows the hardness of certain metals and abrasives.

As seen in terms of Moh's scale of hardness, chromium is a very hard metal, silver a very soft one. Stainless steels vary in hardness; most of them are intermediate between iron and chromium. Chromium is not only very hard but is also very nonreactive, so that its tendency to tarnish is small. This combination makes it an excellent plating material. The "polishes" used on chromium in the home and in the garage do not have much polishing effect. They are essentially

HARDNESS (MOH'S SCALE) OF METALS AND ABRASIVES

Metal or Alloy	*Hardness Value*	*Abrasive*	*Hardness Value*	*Practical Significance of Figures*
Chromium	9	diamond	10	10—will scratch windowglass
Iron	4.5	silicon carbide	9.5–9.7	9—will scratch windowglass
Nickel	4+	fused alumina	9.2–9.6	8—will scratch windowglass
Brass	3+	corundum	9	7—will scratch windowglass, little touched by file
Bronze	3+	emery	8	6—easily scratched by file
Copper	3	quartz	7	5—scratched with difficulty by knife
Aluminum	3–	feldspar	6–6.6	4—easily scratched by knife
Gold	3–	pumice	6	3—scratched by copper coin or by brass pin
Silver	2+	calcite	3	2—easily scratched by fingernail
		gypsum	2	1—very easily scratched by fingernail
		talc	1	

Laboratory *QUALITY* in *MASS* Production



PFIZER ASCORBIC ACID is one of the essential vitamins that illustrate the importance of large scale production to effect economies. Even with mass production methods, Pfizer has maintained "laboratory quality" results by placing emphasis on strict quality control.

In the room pictured here are some of the vacuum pan operations of the Ascorbic Acid (Vitamin C) process. In this operation, and others like it, a skilled staff operates efficiently, working under the close supervision of chemical engineers and other Pfizer technical and scientific personnel.

Insistence on quality is entirely consistent with large volume Ascorbic Acid production at Chas. Pfizer & Co., Inc. That is why on the basis of ready availability many manufacturers have found it pays to standardize on this source for this and other vitamins.

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cleaners to remove the soil and thus give the original luster a chance to appear.

The hard abrasives in the table from the diamond to pumice are not suitable in ordinary polishes but may be incorporated in buffing agents to polish hard metals during the finishing stages of manufacture. Not included in the table is the intermediate type of abrasive used almost exclusively in ordinary metal polish. This is silica sold under different names and of various grades, such as amorphous silica, semi-amorphous silica, and tripoli. The hardness values of the usual grades of silica are between those of calcite and pumice.

POLISHING ACTION

Metal polish in general is intended for application on brass, bronze, and copper. (Polishes for silver, which is a very soft metal, will not be discussed in detail in this article.) In order to *polish* a metal surface, the abrasive must produce fine microscopic scratches not visible to the naked eye. The abrasive must not be harsh enough to cause visible scratches, which is what would happen if silica were used on silver, for example. On brass and copper it gives just the right degree of scratching to make the surface appear smooth and lustrous.

Not only the hardness of the abrasive, but also its particle size is important. This should be fine enough to pass through 200 mesh. Some manufacturers specify 325 mesh. For polishing a soft metal like silver a milder abrasive than silica is used. This may be diatomaceous earth, precipitated chalk, or rouge. These soft abrasives have the same effect on silver that silica has on brass, of producing invisible scratches on the metal surface. If diatomaceous earth were used in brass polish, it would not polish the metal but would merely aid in mechanically removing soil. It would leave the brass clean, but with as dull a finish as it had before cleaning.

CHROMIUM CLEANERS

In the home, probably most chromium-plated pieces of equipment will keep their bright appearance by washing in soap and water, but chromium trim on automobiles is more effectively treated with a special cleaner for the purpose. Examples of water-base liquid products follow:

	%
(1) Amorphous silica	5
Bentonite	1
Orthodichlorobenzene	10
Triethanolamine oleate	3
Excess oleic acid	0.5
Water	80

	%
(2) Tripoli	25
Mineral oil	13
Pine oil	3
Ammonium oleate soap	2
Ammonium oxalate	3
Excess ammonia	0.5
Water	54

Silica is present in these cleaners not as a polishing agent but as a scrubbing agent to remove stubborn soil. Bentonite, although a solid, does not act the same way, but is a colloidal dispersing agent to help keep the silica in suspension. The orthodichlorobenzene should have some cleaning and solvent action although it is questionable whether its cost is justified by its rather minor effectiveness. Soap serves both as a cleaning agent to help remove soil and a dispersing agent to prevent the silica from settling out. In the first formula, excess oleic acid will remain as a light film on the metal to help intensify the cleaning and brightening effect.

In the second formula, the tripoli serves as a mechanical cleaning agent to dislodge solid soil; mineral oil serves as a grease solvent; pine oil is merely an odorant; and ammonium oxalate, excess ammonia and soap are cleaning agents. (Soap also serves to disperse and emulsify the insoluble ingredients in water.) These products may be made by simple mixing together. More commonly the abrasive, solvents, and oleic acid are mixed together and then the soap is formed by addition of the alkali such as triethanolamine or ammonia, in aqueous solution. Stirring is continued until the liquid is uniform and contains no clots, when it is ready for bottling.

GENERAL UTILITY METAL POLISH

The most common form of metal polish is a liquid since this is easy to apply and convenient to use. Some pastes and powders are also made but are less important in terms of volume production. A solvent type liquid polish is illustrated by the following:

	%
Ammonia, sp. gr. 0.9	2.5
Silica, fine mesh	26
Mineral oil, boiling 300-400° F.	64.3
Mixed soap-fatty acids	7.2

Mix the oil, fatty acids, and abrasive. Add ammonia with stirring. This product should remove greasy soil and leave a light oil film for increased brightness.

Water-base polishes are exemplified by the following:

	%
(1) Silica	20
Bentonite	2
Oleic acid	5
Ammonia, sp. gr. 0.88	3
Pine oil	5
Water	65

	%
(2) Silica	23
Ammonium oleate	6
Ammonium oxalate	3
Water	68

In the first formula, the bentonite helps

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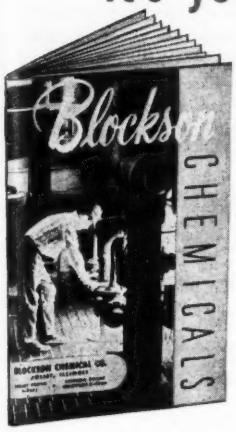

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- ☐ DISODIUM PHOSPHATE, CRYSTALLINE
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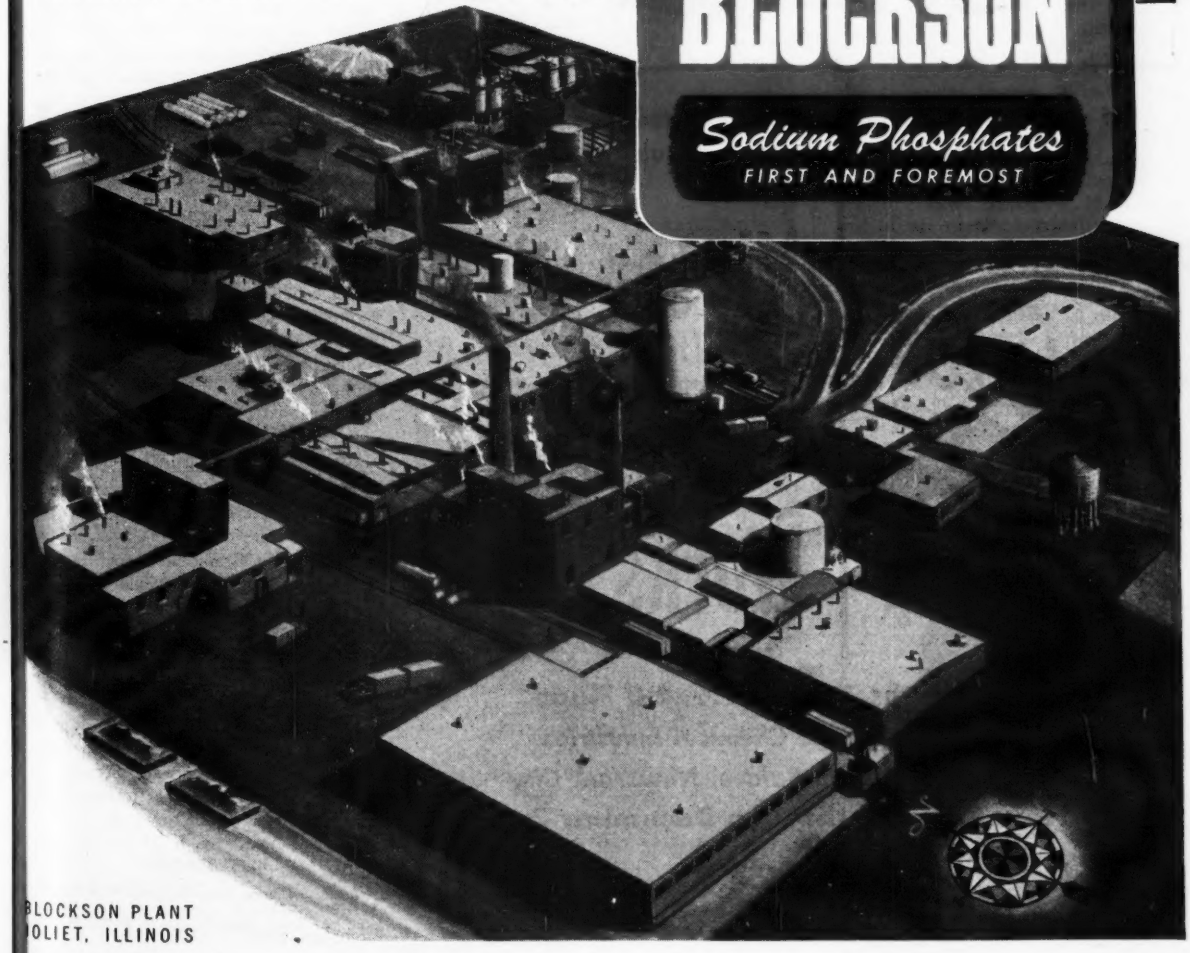

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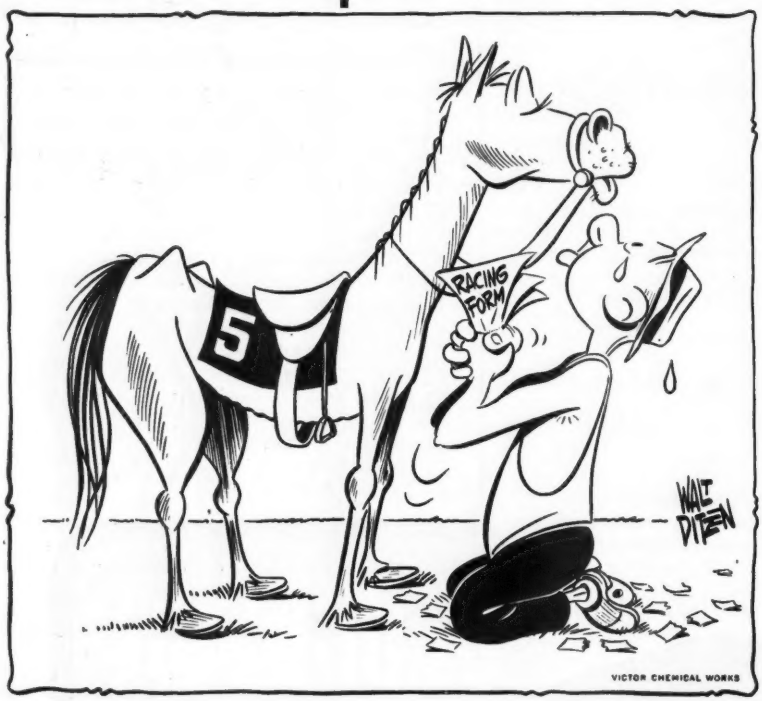

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stabilize the product. Soap is formed by the reaction of ammonia and oleic acid; pine oil is merely an odorant. In the second formula, the ammonium oxalate probably has some stabilizing action but is more important as a chemical cleaner to promote tarnish removal.

If a water-base paste is required, sodium soap is used instead of the potash, ammonium, or similar soap in the liquid products. Two commercial paste products have approximate compositions as follows, the first a naphtha base, the second a water base.

	%
(1) Tripoli	53
Iron oxide pigment	1
Ammonium stearate soap	5
Stearic acid	4
Stoddard's Solvent	37

	%
(2) Silica	50
Sodium stearate	6
Soda ash	4
Water	40

These products may be white, or a pigment or dye may be added if desired. Sometimes enough rouge is added to give a pink color; sometimes a pink dye is used. Perfume materials are sometimes added but are of no great significance.

A powdered product is easily made by simply mixing the ingredients together as in this commercial polish:

	%
Silica, 325 mesh	88
Sodium chloride	6
Tartaric acid	6

The powder is applied with a damp cloth. The metal has to be washed afterward—a step not usually necessary with liquid products. This particular product has been recommended for cleaning chromium and stainless steel. The free organic acid should have a chemical cleaning action on stainless steel.

STEADY DEMAND

While some optimists may have predicted at one time that metal polishes would no longer exist after the advent of chromium plate and stainless steel, this is not the case. Brass and copper, in spite of their propensity to tarnishing, are still used to some extent in the home and in industry, and they require polishing. The less reactive metals also require a special form of cleaning agent for proper upkeep, especially if exposed to the weather as on automobiles. The continued presence of cans and bottles of metal polishes on the shelves of hardware, department and ten cent stores testifies to the steady demand for this specialty.

REFERENCES

1. J. M. Vallance, *Manufacturing Chemist 18*, 75-80 (1947).
2. C. A. Tyler, *Soap 15*, No. 9, 90-92; No. 10, 103-107 (1939).

Antara Products
General Aniline & Film Corporation

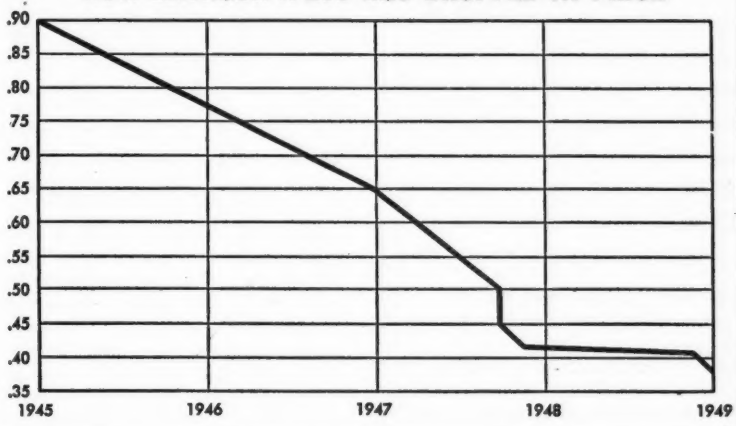
Antara Extra

An Antara Products Publication

Detergents
Emulsifiers
Wetting Agents
Dispersants
Carbonyl Iron Powder

444 MADISON AVENUE NEW YORK 22, N. Y. NOVEMBER, 1949

Antara Products Detergents among Least Expensive on the Market



On a performance basis, the Antarox "A" series manufactured by Antara Products is among the least expensive detergents on the market.

Primarily, the basis of this claim is the steady decline in price of the Antara products since 1945. The chart at the left shows clearly just how the price of one product – Antarox A-200—has changed.

But on performance, the Antarox "A" series shows up even better on the cost sheets. Its versatility, ease of handling and remarkable activity in operation all contribute to making "a little go a long, long way."

Just as an example: a Midwest dairy recently discovered that by using Antarox A-200 in its bottle washing, they immediately got *spectacular* results in their alkali wash tanks. They reported the product to be superior in cleaning fat and protein from the bottles. What's more, they were getting shinier bottles, reduced alkali corrosion of the chain belt and bottle grippers, reduced consumption of alkali and less carryover of straws, butts, etc. Most amazing of all to the company was the fact that the whole process uses only 8 ounces of Antarox A-200, to 5,000 pounds of solution having 3-4% alkali.

This is only one of the many applications where an Antara product has made an established process less expensive *and better.*

If you have a problem involving surface active agents, Antara Products may do the same for you. Write today, outlining the use in mind.

Lazarus Laboratories Markets Successful Cleaner-Sanitizer Product to Dairy Field

For the past 30 years, there has been almost no improvement in the methods employed for cleaning and sanitizing dairies and their equipment. Alkalies, steam, chlorine were some of the methods used – all of them cumbersome, messy, time-consuming and, in the long run, expensive.

Several years ago, Lazarus Laboratories, Inc., a wide-awake outfit in Buffalo, N. Y., decided to do something about it. Their laboratory set to work evaluating combinations of Antara detergents with quaternary salts, consulted with the technical department and worked with its laboratory.

A new product for the dairy industry was born—a cleaner-sanitizer named Kleen-Ezey which was designed to do just what the name implied. Kleen-Ezey is a versatile combination of a non-ionic detergent for cleaning and a quaternary ammonium salt for sanitizing which has proved to be just what the dairies ordered. For Kleen-Ezey cleans and sanitizes in one operation, cutting down on time, labor and costs.

The efficiency of Lazarus Laboratories' new product is so good that they find it hard to keep production apace with the demand. Antara Products service was of material assistance in the formation of Kleen-Ezey.

Antara to Exhibit New Products at Chemical Industries Shows

Ten new products will be displayed by Antara Products, General Aniline & Film Corporation, at the East and West Coast chemical shows scheduled this year.

Antara Products will show products and applications through a unique exhibit with color transparencies, first at the San Francisco Chemical Exposition November 1 to 5, and second at the Exposition of Chemical Industries, Grand Central Palace, New York City, November 28 to December 3.

Products on display will be Carbonyl Iron Powders, a remarkably pure form of iron used extensively in high frequency electronic cores, and nine surface active agents which have a host of wetting, detergent, emulsifying and dispersing applications.

FROM RESEARCH TO REALITY
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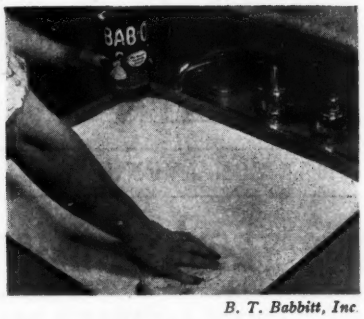
Household Scouring Powders

by JOHN W. McCUTCHEON, Consultant
New York, N. Y.



B. T. Babbitt, Inc.

STANDARD HOUSEHOLD specialties, scouring powders are simple mixtures of selected abrasives, alkaline agents, and detergents.

GENERAL-PURPOSE powders for scouring pots and pans, sinks, bathtubs, painted and enameled surfaces and the like are as common as soap in the housekeeper's scheme of things. Since they are adjuncts to soap and detergents in the kitchen, their volume is small, but they are in steady demand throughout the years.

Something more than the application of a mere cleaning solution is required to do certain cleaning jobs, and that generally is mechanical action supplied by brush, steel wool or an abrasive powder. Which is used depends upon the type of soil usually encountered, and the surface to be cleaned. Scouring powders, as the name implies, depend largely upon an abrasive in the formula, and are about 90% abrasive and 10% detersive in action.

When sprinkled on a damp cloth and rubbed on a greasy pot or pan, the particles of abrasive break up the grease layer, the detergent solution quickly emulsifies it, and the water rinses it away. Hence the slogans found on most canisters of these products: "Cuts grease fast," "Dissolves grease," "Grease dissolving cleaner." The abrasive may also function as a polishing agent by removing films of rust, etc. from metal and other surfaces.

SELECTION OF ABRASIVE

A scouring powder must not contain an abrasive hard enough to scratch and damage the metal, paint or porcelain surface on which it is used. This is a big order, and one which can be met in practice only by compromise, for the housewife uses the product on many surfaces of varying hardness. The amount of "elbow grease" she uses at different times is a variable over which the manufacturer has no control. This, however, is generally worked out to a nicety by the housewife who applies the powder in repeated portions and rubs just hard enough to remove the stain. But if she has been using product "A" for a long time and decides to try product "B", which has a very harsh abrasive, before she knows it, the corner of the refrigerator door is soon showing its prime coat, and the manufacturer of "B" has lost a customer.

Volcanic ash in some form is the material most commonly used to give a powder of intermediate abrasive action that conforms to what the housewife is accustomed to using. It has a Brinell hardness of 6, and a price generally about one and a half to twice that of other materials available for this purpose. Freight costs are large items these days, especially on such a relatively low-priced product as scouring powder, and there is a tendency to pare costs by using a cheaper though somewhat harsher abrasive such as sand. Feldspar, which has an abrasive value similar to volcanic ash and is priced somewhat lower, is a very good material to use. Following, in order of increasing hardness, are materials often used:

Talc: hydrous magnesium silicate; very soft; suitable for special scouring agents for tile and porcelain enamel, but not for general household powder.

Diatomaceous earth: siliceous skeletons of small aquatic plants called diatoms; also called infusorial earth, kieselguhr, tripolite, etc; soft; expensive; not recommended in general household product.

Whiting: washed chalk; suitable for tile cleaners, etc. but not for a general household product.

Marble: calcium carbonate; mild abrasive not generally used in household cleaners.

Volcanic ash: sedimentary rock composed of volcanic dust, ash, and cinders; suitable for use in household cleaners. Pumice, also a derivative of volcanic ash, is slightly harder than it.

Feldspar: mixture of various metal aluminum silicates, chiefly $K_2O \cdot Al_2O_3 \cdot 6SiO_2$. Its hardness is just about the equivalent of volcanic ash, and it is usually of a whiter color, so that it is a very desirable product when available.

Quartz: crystallized SiO_2. It is harder than pumice and is apt to be abrasive on softer metals such as aluminum and copper. Not recommended where milder abrasives are available.

Sand: fine grains of disintegrated siliceous rock, chiefly quartz which it resembles in hardness.

Mesh of the abrasive should be about 100 to 125. If the material is too fine, it is not easy to remove from the canister in which most of these materials are placed. A mesh as fine as 200 is not sufficiently effective. The size, however, should not be limited too strictly to one mesh, but should range rather widely and should contain some material of 200 mesh. A small amount of testing, common sense and a knowledge of the market conditions will enable a manufacturer to arrive at a satisfactory abrasive.

DETERGENT COMPONENTS

To assist the material in cutting grease, it is usual to add from 3 to 10% soda ash although this has the drawback of increasing its harshness to the skin and making the product less suitable for cleaning painted surfaces. Trisodium phosphate is also used for the same purpose, particularly where soap is the detersive agent. Other less alkaline salts, such as borates or polyphosphates, are not commonly used, and such materials as oxalic acid and perborates are to be avoided here.

Since the detergent is present to the extent of only a few per cent, it should be a synthetic. If soap is used, hard water rapidly destroys it in the rinse and therefore a higher concentration should be used. Probably this disadvantage is not as acute as would be the case of a dishwashing compound, but nevertheless, there are many good synthetics which will do the job at the same cost as soap or even at a lower cost. If alkalis are used, the synthetic must not be an ester type; otherwise, there is little restriction on type. Of six common brands of scouring powder found on the New York market, five use a synthetic material as the detergent and one, soap.

Probably the most typical formula would be represented by the following:[1]

Abrasive	80-90%
Soda Ash	10- 1%
Detergent	7- 4%
Moisture	3- 5%

Many types and shapes of containers have been tried on the market, but the standard seems to have settled down to a canister usually with metal ends with openings that can be punched out. Diameter is about 3", height about 5" and capacity 13-14 ounces. The price range for such a scouring powder is 7-12¢.

[1] E. G. Thomssen and J. W. McCutcheon, *Soaps and Detergents*, Chap. 4, MacNair-Dorland Publishing Co., New York, 1949.

NOTES FROM THE ... NUCHAR

purification notebook

NUCHAR FOR ESTERIFICATION

The usual method of applying NUCHAR for esters is on the final ester for decolorizing and polishing up the product. This procedure takes the place of a distillation operation, which entails costly equipment and control.

Rather recently, a new twist has been added to esterification reactions. NUCHAR is added to the esterification kettle at the very beginning of the operation when the acid, the alcohol and catalyst are charged into the kettle. After allowing esterification to proceed as usual, the ester with the carbon present is filtered in the ordinary manner. It was found that lower dosages of NUCHAR produce the desired decolorized ester by this method, and no extra equipment is necessary.

For plasticizer type esters—like the phthalates, aconitates, etc., or for 2,4-D esters, lactates, stearates, etc., 1—2% NUCHAR C-190-N is generally employed in a single stage treatment. Another suggested usage is a double stage treatment whereby 1% once-used NUCHAR C-190-N is added to the esterification kettle, and 1% virgin carbon is applied to the final ester for color removal and polishing purposes. Then the cycle is repeated with the once-used carbon.

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SPECIALTIES NEWS

Pittsburgh Plate Plans California Paint Plant

Pittsburgh Plate Glass Co. expects shortly to sign contracts for the construction of a $1¼ million paint plant at Torrance, Cal. The plant should be ready to go into production within ten to twelve months. General contract for its erection has been awarded to MacIssac and Menke, Los Angeles contractors.

Located about 15 miles from downtown Los Angeles, the plant will be erected on a triangular, 15 acre site. Original equipment will permit production of 1,500,000 gallons annually. Sufficient floor area for additional equipment is available to boost the production to 2,600,000 gallons in the future.

A full line of Pittsburgh house, industrial and automobile paints will be produced at the Torrance plant. Model laboratory facilities will be installed and product development and control programs accelerated. A lacquer producing plant will be moved intact from the firm's plant in Los Angeles. Planned also is the installation of a gas fired resin manufacturing unit.

Lever Moves Offices

Lever Brothers Co. on December 1 will move from its headquarters building in Cambridge, Mass., to New York City, where it will erect a new, 20-story Lever House at a cost of $6 million. Simultaneously with the move of the parent company, the executive and general offices of the company's three subsidiaries—the Pepsodent Co., Chicago, manufacturers of dentifrices; the John F. Jelke Co., Chicago, margarine producers, and Harriet Hubbard Ayer, Inc., New York, cosmetics firm—will be moved into the new centralized offices in New York.

Operation of the manufacturing units of the Company and its subsidiaries will not be affected by this change.

Construction of Lever's new headquarters, an ultra-modern office building on the west side of Park Avenue between 53rd and 54th Streets, is in addition to a $55 million plant expansion program. Also planned are:

1. A $3 million technical research laboratory building at Edgewater, N. J. Here will be centralized all the research work of Lever Brothers and subsidiary companies.

2. A $2 million margarine unit at Hammond, Ind.

3. A $2 million expansion of the Cambridge soap manufacturing plant.

Work on the first two projects will be started immediately. The Cambridge plant expansion will be undertaken as soon as research laboratories, now located there, can be moved to the new location at Edgewater. Manufacture of Jelke Good Luck products will continue at its present Chicago plant until the new Hammond unit is in operation. Construction on the new headquarters will be started in the spring and it is expected the building will be ready for occupancy by the Fall of 1951.

P. Val Kolb (left), named president of Sterwin Chemicals Inc., New York, a subsidiary newly organized by Sterling Drug Inc., and Howard A. Jones appointed assistant director of laboratories of U. S. Industrial Chemicals, Inc. Mr. Kolb has been in charge of Sterling activities that previously handled products the new unit will distribute. Mr. Jones has been assistant director of entomological research at U.S.I.'s Baltimore laboratories.

ACS to Form Insecticide Subdivision

The Division of Agricultural and Food Chemistry of the American Chemical Society at its September meeting in Atlantic City voted for the formation of a subdivision devoted to the chemistry of insecticides, fungicides, and related materials employed in protecting the food supply. James L. St. John, State College of Washington, was appointed to begin organization work, define the scope of the new group's activities, and to select and define a suitable name for it.

Shipping Permits Granted For New Rodenticide

Permits to ship for experimental purposes products containing W.A.R.F.-42, the new rodenticide developed at the University of Wisconsin (*CI, July 1949, p. 31*), have been granted to R. J. Prentiss & Co., Inc. and S. B. Penick & Co., both New York City, by the U. S. Department of Agriculture. Products allowed to be shipped and now available for experimentation are powders containing 0.5% W.A.R.F.-42. These powders are used in preparing various rat and mouse baits by dilution of one part powder with nineteen parts bait.

W.A.R.F.-12 is an anti-coagulant compound which kills rodents by causing them to bleed to death. An outstanding advan-

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tage is that it is "self prebaiting", because it is a slow acting poison and odorless and tasteless to the rodent.

Universal Oil to Build Specialty Products Plant

Universal Oil Products Co. has purchased a tract of land in excess of 600 acres between Shreveport and Mooringsport, La., on the Kansas City Southern Railroad, on which it plans to construct a plant for the manufacture of specialty products. Actual construction will depend on one or two major factors still undecided, but if decisions on these are favorable, the company will start construction on the first unit as rapidly as possible, according to a company official.

Insect-Repellent Stick

A. L. Omohundro, F. M. Neumeier and B. R. Zeitlin (U. S. Patent 2,465,470) offer methods for making insect-repellent sticks that are transparent, stable at the extremes of temperature normally encountered, nonfriable, nonbleeding and easily applied to the skin. These sticks have an unusually high proportion of one or two types of active insect repellent, are made with a soap base and contain plasticizing glycerine to prevent brittleness. A typical procedure calls for the following materials:

o-Dimethyl phthalate	12.2 parts
2-Ethyl-1,3 hexanediol	18.0 "
Isopropyl alcohol (91%)	31.5 "
Sodium stearate, powdered	20.3 "
Glycerine	12.1 "
Distilled water	3.5 "
Color solution	1.2 "
Perfume	1.2 "

The first three ingredients are mixed together and to the mixture is added the soap, glycerine, water and coloring. The combination is heated at 81° to 82° C. with occasional stirring. When a clear solution is obtained (usually after seven to ten minutes), remove from heat and allow to cool to 60° C. Add the perfume and pour into molds, cool to room temperature and remove from molds.

Anti-Corrosion Paint Formulas

Several of the latest type corrosion inhibitive paint formulations for the protection of iron and steel exposed to marine conditions are included in Red Lead Technical Letter No. 4, just published by the Lead Industries Association. Complete detailed formulations of high performance synthetic vehicle paints are presented for marine atmospheres, intermittent salt water immersion and continuous salt water submersion.

Copies of this twelve page booklet can be obtained without charge by writing to the Lead Industries Association, 420 Lexington Ave., New York 17, N. Y.

Booklets on Weed Killers

An integrated series of seven booklets describing the methods and advantages of controlling weeds with chemical sprays in agriculture, industry and municipalities is available from Monsanto Chemical Co. The booklets include instructions for formulating the company's basic herbicidal chemicals, both contact and translocated, and the proper compounds and rates of application for various uses.

Recommended Standard for Wood Preservative

A recommended commercial standard for zinc naphthenate wood-preservative (spray, brush, dip application) has just been circulated by the Commodity Standards Division of the National Bureau of Standards to manufacturers, distributors, users, and testing laboratories for acceptance. Mimeographed copies, TS-4859, of this Recommended Commercial Standard may be obtained from the Commodity Standards Division, National Bureau of Standards, Washington 25, D. C.

Fumigation Test Cage

R. P. Cargille is marketing a transparent plastic fumigation test cage, designed to contain live insects and then to be placed in various locations in an area to be fumigated. The dead insects are counted after the fumigation to determine its effectiveness.

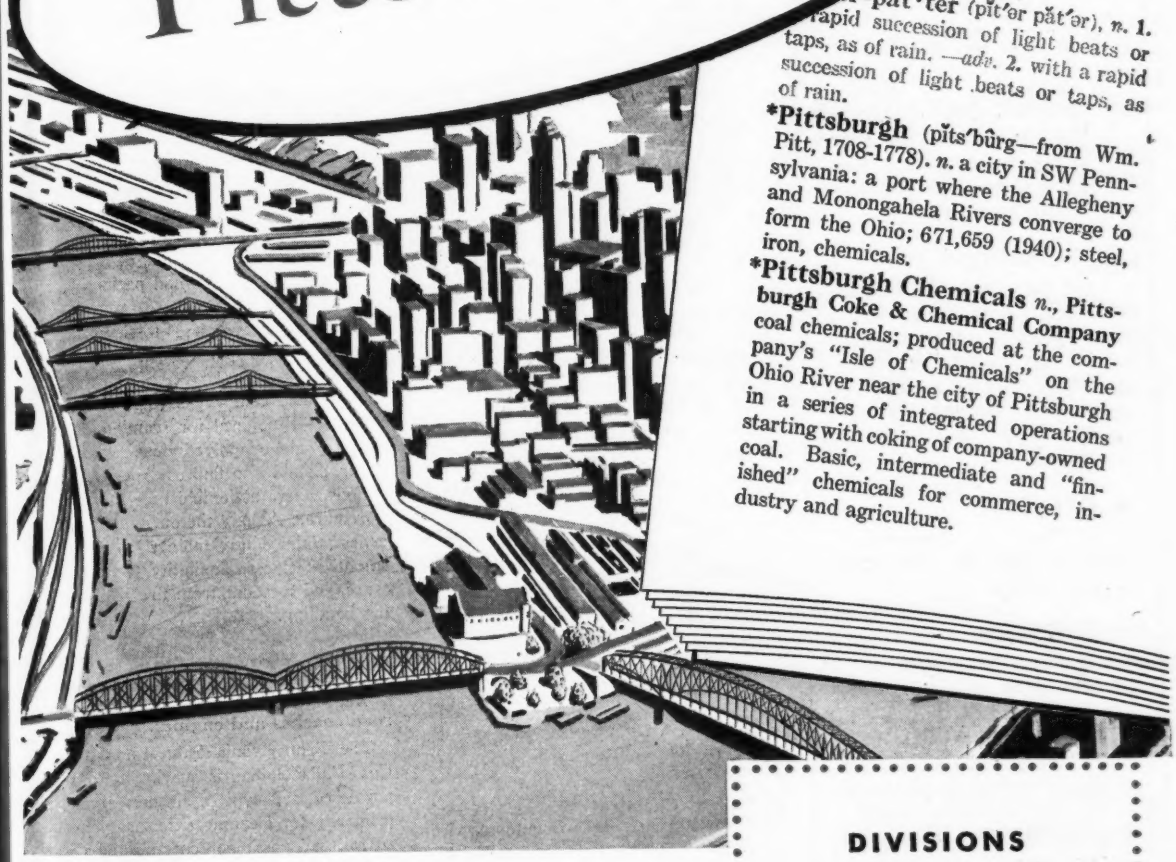
Advantages of this model are that it is easily marked with identifying numbers, string can be easily attached when needed, the flat square shape is convenient for stacking and storing the cages, and the transparency of the cage permits the contents to be examined without opening the cage.

Companies

John Powell & Co., Inc., insecticide manufacturer, has appointed Nassau Chemicals, Inc., 420 Market Street, San Francisco, Cal., its Pacific Coast representative to distribute insecticide concentrates. This action virtually completes the company's expansion program which included the recent opening of a new manufacturing plant and warehouse in Huntsville, Ala.

N. R. Gotthoffer, chemical consultant, has opened offices in Cincinnati. He was research administrator of The Drackett Co., and for a period of 19 years was research and technical director of the Grayslake Gelatin Co. Mr. Gotthoffer serves the food industries, specializing in protein materials and

Pittsburgh*



...operate
...men, one on the log and the o
below it, often in a pit. Also, pit s
Pitt (pĭt), *n.* **1. William,** *(1st Ear*
...om), 1708-1778, British stat
...rator. **2.** his son, Willia
...ritish statesman: prir
...1801 and 1804-06.
...t'əns), *n.* **1.** a sma
...um for living expense
...ncome or remuneration
...nce, t. OF, der, *pitie* pity
..., PITY]
...i-pat·ter (pĭt'ər păt'ər), *n.* **1.** rapid succession of light beats or taps, as of rain. —*adv.* **2.** with a rapid succession of light beats or taps, as of rain.

***Pittsburgh** (pĭts'bûrg—from Wm. Pitt, 1708-1778). *n.* a city in SW Pennsylvania: a port where the Allegheny and Monongahela Rivers converge to form the Ohio; 671,659 (1940); steel, iron, chemicals.

***Pittsburgh Chemicals** *n.*, Pittsburgh Coke & Chemical Company coal chemicals; produced at the company's "Isle of Chemicals" on the Ohio River near the city of Pittsburgh in a series of integrated operations starting with coking of company-owned coal. Basic, intermediate and "finished" chemicals for commerce, industry and agriculture.

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Pittsburgh Coke & Chemical Company has contributed to the city's growth. Its Neville Coke, Pig Iron and associated products have long served Pittsburgh's steel and other industries. In recent years, the Company's Coal Chemicals have enabled the city to take a definite part in the nation's chemical industry. Competent research and expanding facilities have supplied an ever-increasing list of "Pittsburgh" Chemicals that make Pittsburgh Coke & Chemical Company an important supply source for commerce, industry and agriculture. Inquiries on any of these products are invited.

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Empire Chemical Company
Neville Coke Division
Neville Pig-Iron Division
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their applications, and in the treatment of water and industrial wastes.

Sharp & Dohme recently held an official ground-breaking ceremony for its new $4 million Medical Research Laboratories at West Point, Pa. Of brick and steel construction, the new medical research laboratories will contain 110,000 square feet of floor space. The four-story new building is expected to be ready for occupancy by spring of 1951.

Resinous Products Division of Rohm & Haas Co., Philadelphia, is now in plant-scale production of Amberlite IRC-50, a versatile carboxylic acid type cation exchange resin. Full production has resulted in a downward revision of quantity prices.

The California Industrial Minerals Co., Friant, Cal., has been appointed sales agent in several western states for Barden insecticide clay, product of J. M. Huber Corp., New York. Barden clay is a sorptive-type diluent, on the acid side, used in both primary grinds and final letdowns.

The Warwick Wax Co., Inc., subsidiary of Sun Chemical Corp., Long Island City, N. Y., has been appointed exclusive distributor of paraffin to be produced at the Coffeyville, Kansas, Refinery of the Consumers Cooperative Association, Kansas City, Mo. The paraffin units will start production during the last quarter of this year. In order to improve grades of lubricants produced by the Cooperative Refinery and simultaneously produce the highest grades of paraffin, the Cooperative have invested over $2 million in the new wax plant. Fully refined paraffin in ranges from 128° to 165° will be produced in Coffeyville.

Personnel

• **Kolker Chemical Works,** Newark, N. J. has appointed J. G. Brunton as vice-president in charge of sales. He was formerly sales manager of the Agricultural Chemicals Division, Pennsylvania Salt Manufacturing Co.

• Dudley B. Blake has been appointed general sales manager of **United Lacquer Mfg. Corp.,** Linden, N. J., and Everett, Mass. He will supervise a national expansion sales program.

• Arthur F. Bixby, former assistant manager of sales of the Agricultural Chemicals Division of **The Pennsylvania Salt Manufacturing Co.,** has been named manager of sales.

• Fred G. LaPiana has been appointed director of textile research of **Stein, Hall & Co., Inc.** He has been a member of this organization since 1925.

• John A. Stierstorfer has been appointed senior synthetic enamel chemist at the Stamford (Conn.) branch of the **Atlas Powder Co.'s** Industrial Finishes Department.

NEW CHEMICAL SPECIALTIES

Note: This section limited to new finished specialties. New raw materials and intermediates of interest to specialties manufacturers are described in New Products and Processes department.

Polyethylene Adhesives

Two new adhesives for polyethylene-coated surfaces give flexible bonds.

Two new flexible adhesives for polyethylene-coated surfaces have been developed by Naugatuck Chemical Division, United States Rubber Co., Rockefeller Center, N. Y. C. These adhesives, known as Dispersite 1789 and 1822-A, are aqueous dispersions suitable for brushing, spraying or roller coating. The first gives a gray-brown film on drying, whereas the other dries to a transparent, odorless film, suggesting its use in food packaging applications.

Both types are said to have a ply strength of 10 pounds per linear inch when separated at a rate of 2 inches per minute. The company says it feels these adhesives developed for seaming bags of polyethylene or polyethylene-wax coated paper, should also find use in other applications where a flexible type of adhesive is required. Among the outstanding properties claimed are ability to bond to smooth surfaces, flexibility, water resistance, and freedom from fire hazard during handling.

Railroad Cleaner

Acid-type cleaner developed for railroad coaches and engines.

The Pennsylvania Salt Manufacturing Co., Philadelphia, is marketing a new, powdered, acid-type of cleaner, developed primarily for cleaning exteriors of painted railroad passenger coaches and Diesel and electric locomotives. Known as Pennsalt Cleaner AC-19, the new compound is a balanced blend of acid bases and surface active agents, essentially dustless, and easily handled. It is completely soluble in cold water and rinses freely from cleaned surfaces. The product leaves no objectionable streaks or opalescence and, being inhibited, does not promote corrosion.

Anti-Static Compound

Easy to apply, new compound controls many industrial static nuisances.

Merix Chemical Co., 1021 E. 55th St., Chicago, is marketing Merix Anti-Static #79, a liquid that is applied by spray, wiping, or brush to prevent static, static electricity or static shocks, and other inconveniences caused by such phenomena. Non-flammable, fairly fast drying and

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invisible when dry, the compound is useful in the automotive, carpet, textile, printing ink, instrument, phonograph, plastics, printing, X-ray equipment, photographic, etc., fields.

Aerosols

Mothproofer and residual insecticide added to Bridgeport Brass Co. line.

Two new products—Residual Insecticide and Bridgeport Mothproofer—have been added to the Aer-a-sol line of Bridgeport Brass Co., Bridgeport, Conn. Containing 2% chlordane and 3% DDT, the Surface Coat Residual Insecticide finds application for roaches, ants, silverfish, waterbugs and other crawling insects in apartments, restaurants and homes. It leaves a residual deposit said to be effective for 60-90 days. The 12-ounce container retails for $1.69.

The Bridgeport Mothproofer, which contains 10% technical methoxychlor and 20% orthodichlorbenzene as active ingredients, acts as a repellent, mothicide and larvacide in protecting woolen clothes, carpets, draperies, etc., from moth damage. It leaves an invisible protective coat effective during storage for 12 months unless the article is cleaned or washed. The 12-ounce can retails at $1.89.

Air Freshener

Air deodorant sold with wall dispenser.

Fuld Bros., Inc., 702 S. Wolfe St., Baltimore, Md., is marketing to distributors a new air deodorant, Vitozone Liquid Air Fresh, to be used in combination with a wall dispensing unit. The deodorant evaporates into the air from a dispensing dish and an adjustable wick in a small cabinet. Available in surf or bouquet odors, the deodorant is sold for use in lavatories, kitchen, hotels, theaters, etc.

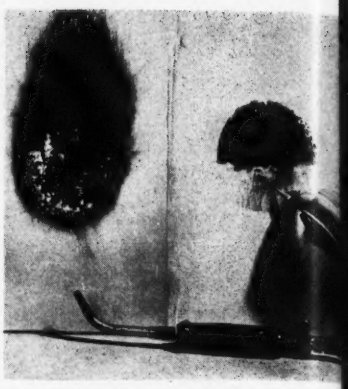
Fire-Retardant Coating

Coating which retards fire offered for experimental purposes.

A paint that creates an inch-thick insulating marshmallow-like substance when exposed to flames or extreme heat, has been developed on an experimental basis by The Sherwin-Williams Co. It is designed for indoor uses—primarily basement ceilings—and for aircraft interior finishes, but it is hoped that it may be used eventually as an undercoater for house paint.

The new coating, a powder thinned with water, resembles clear varnish in appearance. Once applied it may be covered with a coating of conventional paint to provide color, if desired, without altering its fire-retardant qualities.

Temporarily known as "Coating X", the new fire-retardant is available only for experimental purposes at the present. The manufacturer will explore further uses and conduct more exhaustive tests before making it commercially available.



Wood covered with conventional paint (left) chars in test with welder's torch; that protected with Sherwin-Williams fire-retardant paint (right) forms insulation against heat.

General-Purpose Disinfectant

Pine-type germicide contains substituted phenol as active ingredient.

Scento-Pine, a new disinfectant, deodorizer and cleanser with a pine oil fragrance, is now being marketed by Huntington Laboratories, Inc., Huntington, Ind. Containing Monsanto Chemical Co.'s substituted phenol, Santophen 1, as its active ingredients, it has a phenol coefficient of 5 against S. typhosa and 7 against S. aureus. Diluted one part to 100 parts water to make an effective germicidal solution, it is suggested for shower room foot baths, lavatories, floors, etc., in public buildings.

Metal Cleaner

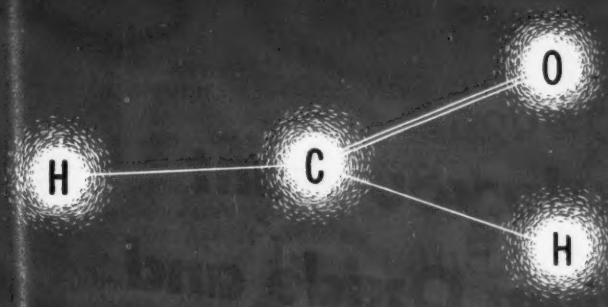
Surface treatment for aluminum, steel and zinc prior to finishing.

Enthone, Inc., 442 Elm St., New Haven, Conn., has developed a solvent phosphoric acid type cleaner for degreasing and preparing steel and other metals for painting at room temperature. Called Surprep, it is applied full strength or diluted with water by paint brush or cloth, allowed to stand for several minutes, and then wiped off or hosed off. It is said to give an uniform etch and to deposit a light phosphate film which gives an excellent tooth for a finish. It comes in one-gallon jugs, 5- and 12-gallon carboys, and 50-gallon barrels.

Adhesive for Photographs

Vinylite solution sold for mounting photographs.

A solution made with Vinylite resins, called Photo Bond, is being manufactured by Photo Bond, 545 W. Market St., Akron, Ohio, for use in mounting pho-



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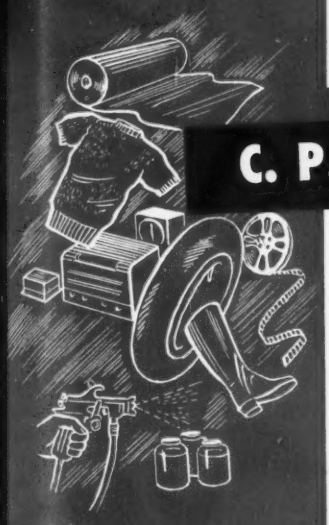

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tographs. Mounted with this adhesive, prints did not lift after two days' soaking in water and exposure to temperatures up to 200°F. due to the sun's rays through a plate glass window. Available at drug and photo supply houses, it retails for 65¢ for 8 oz., $2.35 for 1 qt. and $8.55 for 1 gal.

Resin Core Binder

Synthetic resin binder for sand cores and dry molds now in liquid form.

Cycor Resin 191, which is a liquid, synthetic resin binder for sand cores and dry molds, is now available from the plastics department of American Cyanamid Co., 30 Rockefeller Plaza, N. Y. C. It can be pumped and/or metered and is otherwise adaptable to existing equipment and methods common to many foundries. This new product is similar to the dry powder Cycor 151 in that it contains none of the additives, such as cereal, fly ash, silica, flour, etc. However, these lower priced items may be added as necessary in the Muller to produce cores of whatever properties the user desires. It produces water-resistant cores which withstand high humidity and long lay-overs in the mold and it can be cured in either conventional or electronically heated ovens.

Soil Fumigant

Concentrated ethylene dibromide preparation is cheaper to use.

A new soil fumigant formulation, Dowfume W-85, said to bring growers substantial savings in fumigant costs is available from The Dow Chemical Co., Midland, Mich. A concentrated ethylene dibromide preparation, it will supplement Dow's other soil fumigants for control of wireworms, nematodes and other costly soil pests.

This new concentrated product can be diluted by the user to the same strength as Dowfume W-40, or any other desired concentration, with kerosene, Diesel oil or petroleum thinners.

Plywood Adhesive

Precatalyzed resin adhesive aids hot-pressing in plywood industry.

A new powdered adhesive for hot-pressing of plywood has been developed by the Resinous Products Division of Rohm & Haas Co., Philadelphia. Designated as Uformite 507, the new adhesive is a precatalyzed urea-formaldehyde resin, tan in color and readily dispersible in water. Salient properties include: dustless handling; simplified glue mixing; excellent compatibility with wheat flour extenders, and good pot-life and range of assembly time. Kept cool and dry, it remains essentially unchanged in storage for at least a full year.

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Low Cost Lacquer Enamels

Atlas introduces new line of lacquer enamels.

A new line of low-cost gloss lacquer enamels for manufacturers of wooden toys, chain store household items and novelties has been introduced by the industrial finishes department of Atlas Powder Co., Stamford, Conn. and North Chicago, Ill. The new products, known as Zapon 401-191, may also be used on pretreated or primed metal.

Formulated for either spray or dip application, this grade is said to possess unusually good adhesion to wood. It air dries with normal lacquer speed, producing a tough, durable finish.

Dry Lubricant

Molybdenum compound powder used as dry lubricant in extreme bearing pressure application.

A new and less expensive grade of Molykote lubricant, known as Type Z, is available from The Alpha Corp., Greenwich, Conn. A smooth-textured molybdenum compound powder, it is said to have exceptional chemical and thermal stability and inertness, resisting attack of all but a few acids, and its lubricating characteristics being unaffected from subzero to 750° F.

Molykote, Type Z, may be applied dry as a powder or mixed with solvents, oils or greases. It is used as a wear-in lubricant for dies, gears, and machinery; thread lubricant, especially on threaded connections subject to high temperatures for sustained periods; and lubricant in drawing and cold forming.

Adhesive

Rubber-based adhesive replaces rivets for bonding brake linings.

A new rubber-based adhesive called "plastilock" has been developed by B. F. Goodrich Co., Akron, Ohio, and General Motors Co. First commercial application of the adhesive has been made by Chevrolet for bonding linings to truck and passenger car brake shoes entirely eliminating rivets and substantially increasing brake life and efficiency. The adhesive has twice the safety of rivets at the same time doubling the life of a car's brakes, according to automotive engineers.

Paint Remover

Nonflammable flush-off paint remover improved by Dow.

The Dow Chemical Co., Midland, Mich., has improved its nonflammable flush-off paint remover formula first described in December, 1948. The new remover raises almost all common paint, varnish, and lacquer films in 1 to 10 minutes permitting ready removal by flushing with water. As previously announced, Dow will not market these formulations, but offers them to the paint and allied industries.

This new formulation will be designated as D316-14A and embodies two changes: The use of 4000 cps. Methocel, PRG and the replacement of the amines used in D316-14 with di-triisopropanoltmine, PRG. It is less corrosive to steel, tin plated steel, and aluminum alloys, and is also more stable. By eliminating ethylamine, it avoids objectionable vapors during the preparation of the remover.

Mortar

New mortar marketed for use in silica brick construction.

General Refractories Co., 1520 Locust St., Philadelphia, has recently placed on the market a new mortar, for use in construction with silica brick and for repairs to all silica brick construction, particularly that in open hearth and electric furnaces and in glass tanks. Of high workability and refractoriness, it is composed of very pure silica (alumina content of 0.02%) that is finely ground, and a special bonding agent that contains no sodium silicate.

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Emulsifier Chemical

Low-cost diethylaminoethanol designed as intermediate for oil-in-water emulsions.

A new technical diethylaminoethanol is now in production by Sharples Chemicals Inc. It is a low-cost product developed especially for emulsion work. This tertiary amine forms an azeotrope with water, improving water-spot resistance of wax films. It may be employed as a replacement for high-priced emulsifier intermediates with no quality reduction. It may be used with lower-cost emulsifiers to improve quality. It is suggested as an intermediate in making oil-in-water emulsions; for example, self-polishing floor waxes, automobile, furniture, and glass-type polishes, emulsion paints, etc. Samples are available.

Acrylic Powder

Soft-flow acrylic molding powder offers high moldability where heat resistance is no factor.

A new soft-flow acrylic molding powder designated as Plexiglas VS is now available in commercial quantities from the Rohm & Haas Co., Philadelphia. It is said to offer exceptional moldability combined with water-white clarity equal to that of the heat resistant "V" and medium-flow "VM" molding powders. Addition of the soft-flow VS, as a general-purpose formulation for molded parts where high service temperatures are not required, completes the company's line of "V" grade injection powders.

Physical and chemical properties are similar to those of the medium-flow VM powder. Heat distortion temperature of the new powder under standard A.S.T.M. test (2° C. per minute, 264 psi) is 66° C., (151° F.) as compared with 79° C. (174° F.) for Plexiglas VM. Its ease of working is said to promise lower molding temperatures and possible faster cycling.

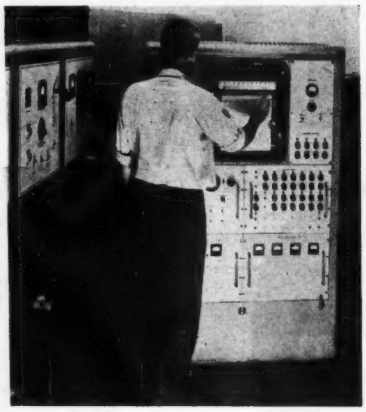
Steel Analysis

Spectrometric method for stainless steel analysis is fast and accurate.

A direct reading method of analysis for stainless steels has been developed which is, in every respect, equivalent in accuracy to present routine chemical methods. The total time of analysis for all metallic elements is two to three minutes including sample preparation. Duplicate analysis on a single sample for these constituents can be made in a total time of three to four minutes.

The precision attained for chromium and nickel is much higher than has ever been reported for any spectrochemical system. A variety of rolled and cast samples repeatedly provided standard deviations from 0.3 to 0.4 per cent of the quantity measured. Thus for an 18% chromium determination this represents an error of .07%; for an 8% nickel determination an error of .03%.

The equipment utilized consists of an Applied Research Laboratory two meter



spectrometer, a recording console, and a Multisource.

A complete paper of technical information is available from the Applied Research Laboratories, 4336 San Fernando Road, Glendale 4, Calif.

Plasticizer

Tri-2-chloroethyl phosphate confers flame resistance on cellulosic, acrylic, and other plastics.

Carbide and Carbon Chemicals Corp. has commercially available "Flexol" plasticizer 3CF (tri-2-chloroethyl phosphate), a flame-resistant plasticizer designed primarily for use with cellulose acetate and mixed cellulose esters. "Flexol" 3CF is also widely useful as a plasticizer for nitrocellulose, ethyl cellulose, methacrylate resins, and synthetic rubber.

When "Flexol" 3CF is used as the sole plasticizer in cellulose acetate films, concentrations as low as 10 per cent are reported to produce self-extinguishing compositions. This plasticizer pours freely below —25°C. and is less volatile than dibutyl phthalate. The solubility of 3CF in mineral oil at 20°C. is less than 0.7 per cent by weight, but 3CF is miscible with the common lacquer solvents.

Prior to the war, tri-2-chloroethyl phosphate was produced in Germany and marketed in the United States as Cetamoll QU. "Flexol" plasticizer 3CF represents an improvement over the imported product. 3CF is lower in acidity and much more stable to the prolonged heat encountered in commercial molding practice.

Dioctyl Phthalate

Tennessee Eastman offers DOP with low color guaranteed.

A substantial refinement in its manufacturing process has enabled Tennessee Eastman Corp. of Kingsport, Tenn., to produce a new low-color dioctyl phthalate (DOP). Both a plastic and an electrical grade are offered having a maximum APHA color rating of 50. It is believed that this is the first time specifications have been published which guarantee such color characteristics. Color ratings of this widely-used plasticizer are ordinarily in the order of 100 for non-electrical use and 150 for electrical purposes.

Titania for Enamel

New grade of titanium dioxide designed for vitreous enamel and other ceramics.

A new grade of titanium dioxide has been developed especially for vitreous enamels and the general ceramic field by the Du Pont Co. The distinguishing characteristic of this new product is its free-flowing properties, which permit satisfactory dry mixing and handling.

It was developed for use in vitreous enamels as an opacifier and is expected to have application in the ceramic field as well. Effective use of titanium dioxide has been made possible by recent developments in the method of manufacturing vitreous enamel. It is replacing other materials because of the economy in its use and the ability to obtain opacity with a thinner film, thus imparting greater flexibility without cracking. It also adds to the acid resistance of the enamel.

Du Pont's new grade of titanium dioxide, which has been trade-marked "Ti-Pure" VG, has a chemical purity equal to pigment grades. Particles are large and the material is free-flowing.

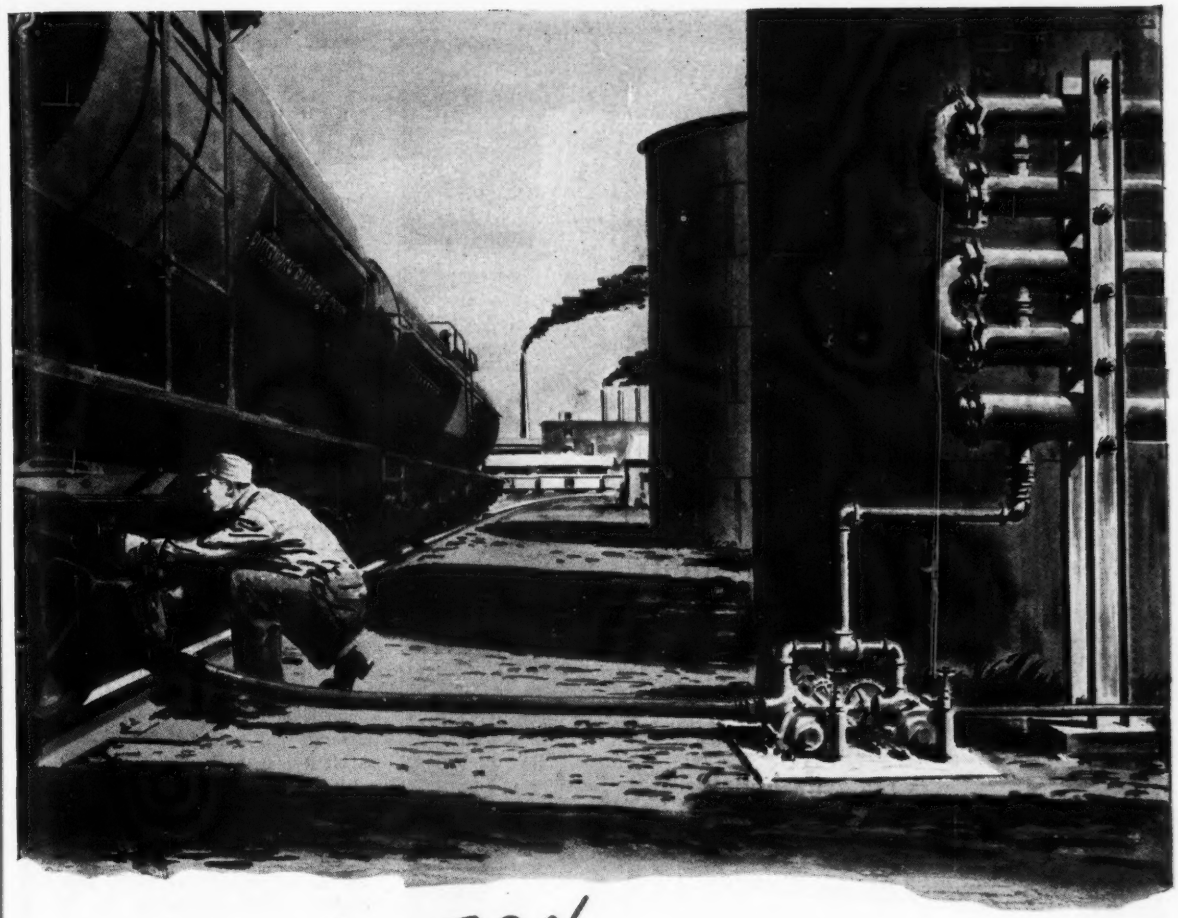
Principal advantages are: it will not stick or ball during dry mixing; premixing or hammer milling is eliminated; handling is improved; there is little dusting in handling; and its bulk density reduces required warehouse space and charge volume.

Now available for shipment, the basic price is 19.5 cents per pound in carloads.

Diallylcyanamide

Trial-lot quantities of diallyl-and other dialkyl-substituted cyanamides offered.

Diallylcyanamide is being offered for the first time in trial-lot quantities by the American Cyanamid Co. This new material is a liquid having a boiling point of 222° C. and a freezing point below —70° C. Less than one per cent soluble in water at 28° C., diallylcyanamide is miscible



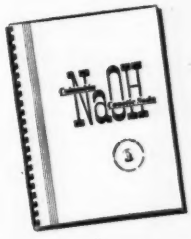
73% vs. 50%

LIQUID CAUSTIC SODA

increased freight rates require an up-to-date analysis of your delivered costs—basis NaOH

Many volume users of Caustic Soda are finding it advantageous to purchase 73% rather than 50% liquor. Substantial savings are thus realized through the greater Caustic content per car.

A patented Columbia process incorporates unloading and diluting in a single operation, in many cases permits present storage facilities to be used without alteration. You may find it profitable to use 73% Caustic. It's worth checking into. Write Pittsburgh Plate Glass Company, Columbia Chemical Division, Dept. CS-1, Fifth at Bellefield, Pittsburgh 13, Pennsylvania.



ARE YOU INTERESTED IN MORE FACTS? Your copy of the Columbia Caustic Soda Manual contains more detailed information on the use of 73% vs. 50% liquor. Additional data and recommendations are available from Columbia's Technical Service Department. Your inquiries are invited. Write to Dept. CS-1.

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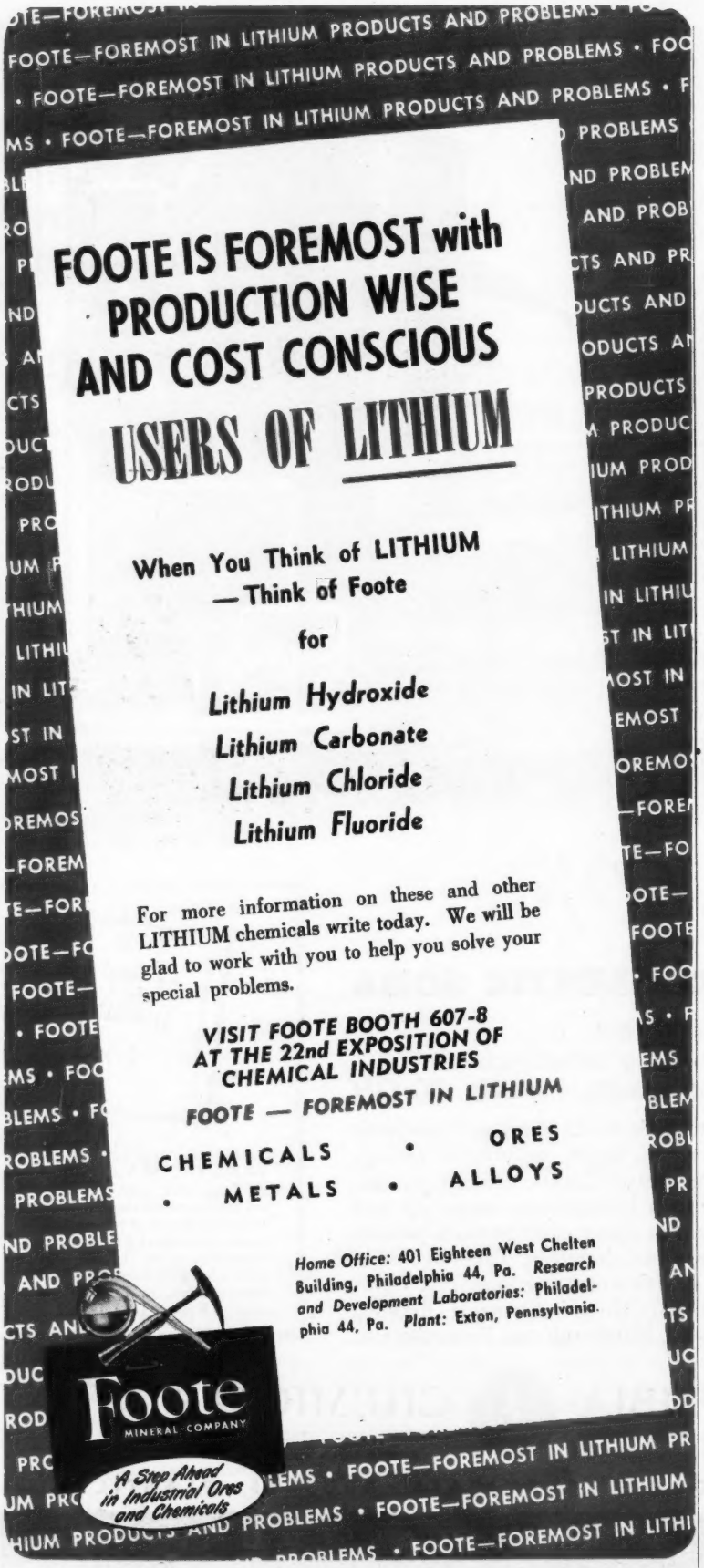
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with most organic solvents and acts as a solvent for most natural and synthetic resins.

The chemical reactions of diallylcyanamide are based mainly upon the reactivity of the nitrile group with compounds containing active hydrogen, such as water, amines, alcohols, and hydrogen sulfide. These and other reactions will bear further investigation.

In addition to diallylcyanamide, the dimethyl, diethyl, and diisopropyl cyanamides are also available in experimental quantities. A technical bulletin describing the chemical and physical properties of these compounds is available upon request from the New Product Development Department, American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y.

Pennyroyal Substitute

Imitation pennyroyal oil licks shortage of natural oil at cost saving.

To help meet the serious shortage of pennyroyal oil, Magnus, Mabee & Reynard, Inc., has perfected a scientific replacement that combines all the important characteristics of the natural oil with a price that makes for much greater economy. Having an odor very similar to the natural oil, Imitation Pennyroyal Oil, MM&R may be used in its place in all technical preparations without any change in formulation.

Further information regarding imitation Pennyroyal Oil MM&R may be obtained by writing to the firm's New York office at 16 Desbrosses St.

Alumium Isopropoxide

Carbonyl reducing agent of 99 per cent minimum purity offered.

Commercial quantities of aluminum isopropoxide, valuable reducing agent used in the pharmaceutical, flavoring, and perfume industries, are being produced by Tennessee Eastman Corp., Kingsport, Tenn., and are immediately available.

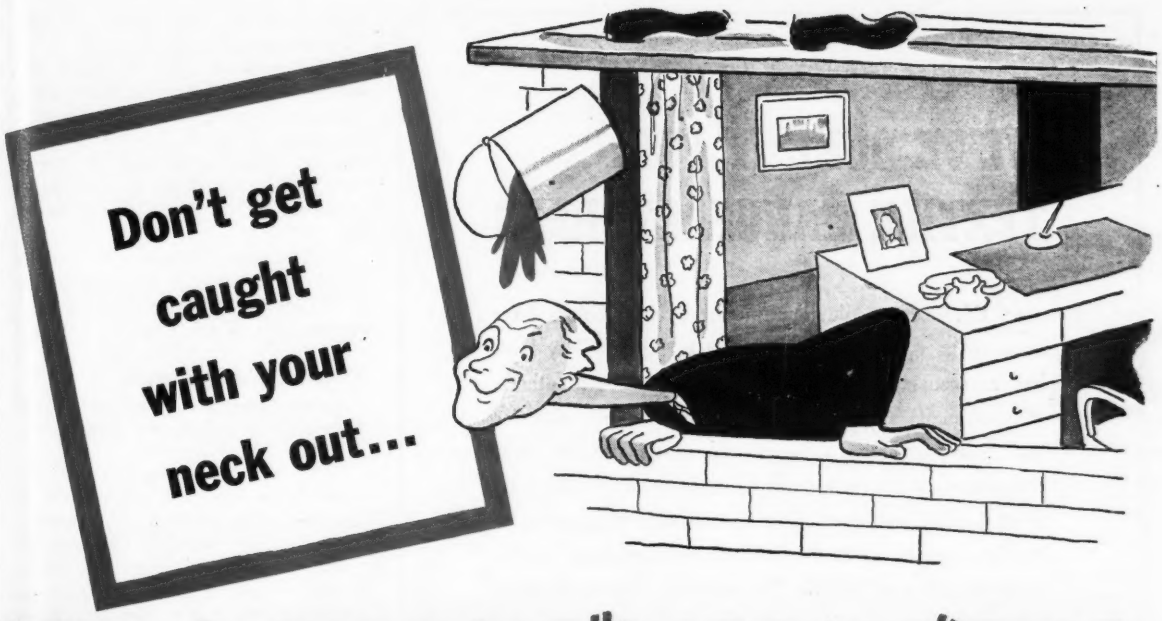
This chemical is specific in its reaction with carbonyl groups of aldehydes and ketones. Its mild action makes it well suited to the selective reduction of such compounds as hormones, vitamins, alkaloids, and other complex organic molecules.

The compound as prepared by Tennessee Eastman is of 99 per cent minimum purity.

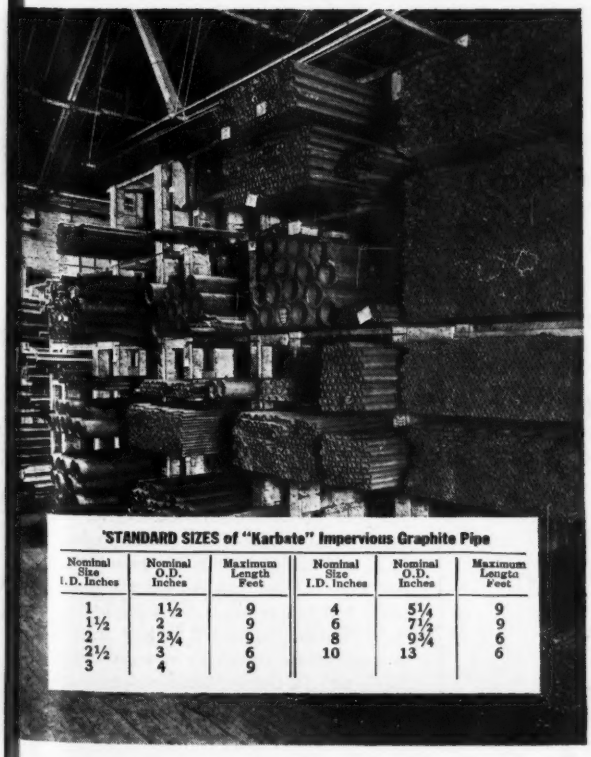
Polyester Resin

Monomer for styrene modification suggested for casting and laminating.

Genpol polyester resin A-20 is a straight unmodified polyester resin of the flexible type. Characterized by a low degree of molecular unsaturation, the monomer features low exothermic heat of reaction and is highly fluid. Genpol A-20 can be used for both casting and laminating applications, either alone or in con-



KEEP A STOCK OF "KARBATE" PIPE TO HANDLE ANY EMERGENCY!



STANDARD SIZES of "Karbate" Impervious Graphite Pipe

Nominal Size I.D. Inches	Nominal O.D. Inches	Maximum Length Feet	Nominal Size I.D. Inches	Nominal O.D. Inches	Maximum Length Feet
1	1½	9	4	5¼	9
1½	2	9	6	7½	9
2	2¾	9	8	9¾	6
2½	3	6	10	13	6
3	4	9			

KEEP a full stock of corrosion-resistant "Karbate" Impervious Graphite Pipe in an adequate range of sizes and you will never be caught short by an emergency replacement job . . . or have to waste time ordering whenever there is a routine repair to be made. "Karbate" pipe, valves, fittings, towers, pumps, tanks and other equipment offer you many advantages:

- **Both acid-resistant and alkali-resistant**
- **Light in weight, easy to machine and assemble**
- **Immune to thermal shock**
- **No metallic contamination of product**

Write for new Installation Manual, Catalog Section M-8801A, Address Dept. CI

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Division Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

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WE'VE DONE IT FOR TEXTILE MANUFACTURERS

YES, even textile manufacturers and dealers have come to us with problems relating to odor. They have had us scent some of their fabrics and de-scent others. Delicate materials have been made to seem even daintier and more attractive through the subtle use of odor. Imagine, for a moment, the enhanced appeal of a flowered print faintly perfumed with a fragrance suggestive of its floral motif! But the problem of rendering textiles more attractive is probably far removed from *your* present interests. Our point is simply, that if we can do this for the textile people . . .

PERHAPS WE CAN DO IT FOR YOU!

For years, our laboratories have been engaged in the study and development of technical odor specialties for industrial application, and many of these are now being usefully applied in widely separated fields. It is quite possible, therefore, that we have the answer to your problem — whether it involves an appropriate fragrance for your product or the elimination of an unpleasant processing odor in your plant — right at our finger tips. If so, a letter explaining your problem will have our full and satisfactory response by return mail. Of course, you assume no obligation unless we can help you.

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FACTORY: *Clifton, N. J.*

junction with polyesters of the rigid type.

Because Genpol A-20 is supplied in unmodified form, it must be mixed with styrene monomer before use. The ratio of styrene to polyester determines the physical properties of the finished cured copolymer. High proportions of styrene yield tough, hard products, while lower proportions result in flexible soft materials.

Inquiries and requests for samples should be directed to the attention of E. V. Osberg, The General Tire & Rubber Company, Akron, Ohio.

Alanine Compounds

Alanine derivatives suggested for surface-active agent and other syntheses.

Two new chemicals, not previously disclosed in the literature, are available in experimental quantities from the manufacturer, B. F. Goodrich Chemical Co.

N-Hydroxyethyl-β-alanine is distinguished by three chemically active groups, hydroxyl, amino, and carboxyl, which makes the material especially useful as a chemical intermediate for organic synthesis. It is furnished as a light buff-colored crystalline solid, is miscible with water, soluble in acids and alkalies, slightly soluble in alcohol, and insoluble in benzene and chlorinated hydrocarbons. It has a melting point of 143-145° C.

N-Dodecyl-β-alanine may be of special interest as an emulsifier, wetting agent and detergent in the pharmaceutical, soap, and cosmetic industries. It is reactive with both inorganic acids and bases furnishing corresponding salts which notably decrease the surface tension of water. Furnished as a white, waxy crystalline solid, it has a melting point of 55-60° C. It is insoluble in water and is soluble in sodium hydroxide solutions, alcohols, chlorinated hydrocarbons and benzene.

A data sheet and samples are available upon letterhead requests to the Chemical Sales Department, B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15, Ohio.

Dihydrazine Sulfate

Semi-commerical hydrazine salt useful as intermediate, reducing agent, catalyst.

Dihydrazine sulfate, $(N_2H_5)_2SO_4$, is now being produced by Mathieson Chemical Corp. in semi-commercial quantities for the first time and is available in one-pound bottles and drums. Containing 37.5 per cent available hydrazine, N_2H_4, the salt is being produced as a flaked product. It is said to have sixty per cent higher hydrazine content than hydrazine acid sulphate and twenty times the solubility.

Applications suggested include its use as a carrier for hydrazine in organic synthesis and in the synthesis of pesticides and herbicides, as a catalyst in polymerization of vinyl type resins, and as a re-

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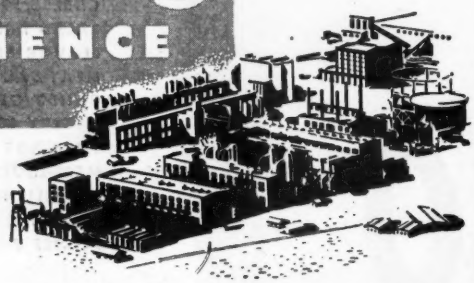

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Barrett Standard Anhydrous Ammonia is America's leading source of NH_3. Its dependable quality, consistent purity and uniform dryness have made it the standard for the chemical industry since 1890.

Barrett Standard Anhydrous Ammonia is available in two grades:

▶ **Refrigeration Grade, guaranteed minimum 99.95% NH_3.**

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Both grades are shipped in tank cars with a capacity of approximately 26 tons of NH_3. Refrigeration Grade only is also packaged in 150, 100 and 50-pound cylinders. Tank car shipments are made from Hopewell, Virginia, and South Point, Ohio. Loaded cylinders are stocked at points conveniently located from coast to coast.

Barrett Standard Anhydrous Ammonia passes rigid tests for moisture, non-condensable gases and other impurities, before release for shipment. Cylinders and tank cars are thoroughly cleaned and inspected, upon return to the plant, before reloading.

The advice and help of Barrett technical service men are available to Barrett customers without charge. Free literature on Barrett Standard Anhydrous Ammonia will be mailed on request.

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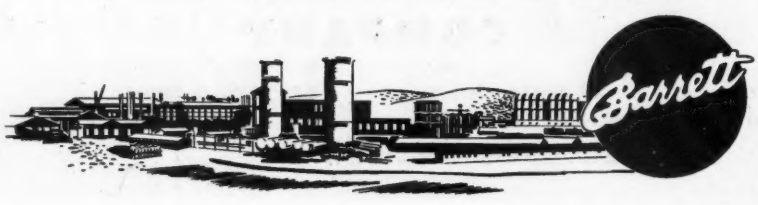

ducing agent for metal finishing operations.

A technical data sheet, No. 124.1, on dihydrazine sulfate is available on request to the Product Development Department, Mathieson Chemical Corp., 60 E. 42nd St., New York 17, N. Y.

Flat Alkyd

Pure long oil alkyd gives high washability, easy brushing to interior flat paints.

A new alkyd resin, a vehicle for quality flat wall paints with which brushing time is cut by 25 per cent, has been developed by U. S. Industrial Chemicals, Inc., 60 E. 42nd St., New York 17, N. Y.

Wet scrub tests using paints containing the resin have shown resistance to washability five to seven times greater than nationally-advertised flat wall paints tested, the company said.

The solution, known as Aroflat 3010, and classified as a pure long oil alkyd, is the first resin of this classification offered as a single vehicle for use in the production of flat wall paints.

In addition to its greater washability and ease in brushing, Aroflat is characterized by its high degree of non-penetration and color retention. The company stated that tests demonstrated improved "lapping in" properties with a minimum tendency to "flashes," or glossy streaks where paint film is more thickly applied. Faster drying properties likewise are imparted to paints using this resin. Aroflat insures easy grinding, it was said, and may be used with all pigments, providing good package stability.

The development is especially significant in view of the current trend toward darker colors for interior walls. It helps to overcome one of the serious defects of deep-tone flats, now made with conventional vehicles: their tendency, when scuffed even slightly, to show chalk-like marks that appear unsightly against the dark background.

Ethyl Trifluoroacetate

Chemical intermediate available in experimental quantities.

The Dow Chemical Co., Midland, Mich., is offering experimental quantities of ethyl trifluoroacetate, a colorless liquid with a pleasant odor, possessing a very low order of toxicity. It is used in the preparation of trifluoroacetone. The ester and the acetone undergo a Claisen condensation to form hexafluoroacetylacetone used in the separation of rare earths. It is used as an intermediate for the introduction of CF_3CO groups and CF_3COH groups into organic compounds by the Claisen, Friedel-Crafts, Grignard and other similar condensation reactions. Ethyl trifluoroacetate is a starting material for the preparation of many possibly useful monomers.

ATLANTIC PETROLEUM CHEMICALS

ULTRAWET 60L

This BRAND NEW liquid Ultrawet is crystal-clear even below 20° F

Atlantic Research has added a really amazing detergent to the ULTRAWET line of "tailor-made" surface-active agents. ULTRAWET 60L is a liquid organic alkyl aryl sulfonate; it is 60% active and 40% water. It has superior wetting, high-foaming, and excellent penetrating characteristics. In addition this newly developed ULTRAWET 60L remains *crystal-clear* even below 20 degrees Fahrenheit. These are properties not exhibited by any other commercial detergent for the money.

If you are selling a liquid detergent for household or institutional use, the solubility of ULTRAWET 60L is a real sales advantage. It is outstanding, too, for shampoos and other cosmetic applications. Its *extra* solubility offers much for textile and other industrial wet processes. It is available in drums and tank cars. ULTRAWET 60L is just one of many ULTRAWETS, each one of which is designed for specific applications and processes.

● APPLICATIONS	● ULTRAWETS					
	30E	30DS	35K	60L	DS	K
Form:	Liquid	Liquid	Liquid	Liquid	Flake	Flake
Minimum % Solids:	30	30	35	60		
Minimum % Active-Solids:	85	85	90	60	85	85
EMULSION BREAKING	✓					
LIGHT-DUTY HOUSEHOLD DETERGENTS			✓			
PENETRANT	✓	✓				
INDUSTRIAL DETERGENTS					✓	✓
HEAVY-DUTY HOUSEHOLD DETERGENTS			✓			✓
EMULSIFIER					✓	✓
WETTING AGENT	✓	✓				
CHARGE STOCK FOR SPRAY AND DRUM DRYING			✓			
DRY MIXING WITH ALKALIS					✓	✓
LIQUID HOUSEHOLD DETERGENTS		✓				
COUPLING AND SOLUBILIZING	✓					

For samples, further information and quotations, communicate with

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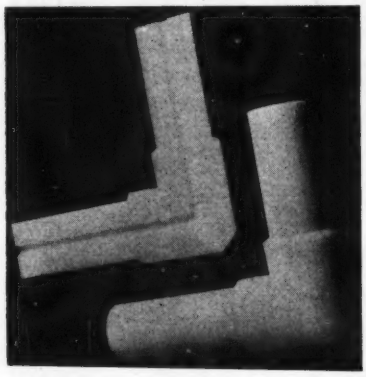
NEW EQUIPMENT

Cold Pipe Insulation

New cold pipe insulation is made of Styrofoam.

A new light weight pipe and vessel insulation, K-Shield, has been developed by Robinson Industries, Coleman, Michigan. The new product is especially suited



for cold pipe insulation, and application consists of a simple covering procedure.

K-Shield is made of the expanded plastic, Styrofoam, containing thousands of minute closed-wall cells.

Although K-Shield is extremely light (weighing approximately 1¼ to 1½ pounds per cubic foot), it is a highly workable rigid material which is its own moisture barrier. High moisture-vapor resistance and an uncanny resistance to mold growth, rot and decay are other outstanding properties.

Plug Valve

New corrosion-resistant plug valve features a composite plug.

A new Durco valve, embodying the general design features of the Durco top lubricated plug valve, has been developed by The Duriron Co., Inc., Dayton 1, O.

New features are:

1. A composite plug. The plug proper is made of a hard corrosion-resisting alloy, such as Duriron or Durichlor. The shank is of stainless steel permanently bonded into the plug, giving positive mechanical action.

2. The body and gland are regularly made of Durimet 20 but other alloys are available on special order.

3. The packing for the stuffing box is a combination of hard and resilient packing rings and a Teflon anti-friction packing seal.

Spray Nozzle

New spray nozzle's spiral design is non-clogging; produces finer atomization.

A new spray nozzle is available from the Bete Fog Nozzle Co., 20 Federal St., Greenfield, Mass.

The new Bete nozzles shear a continu-

ous film from a single, high velocity jet. This breaks up into uniformly fine particles at relatively low pressures. No vanes nor whirl discs are required.

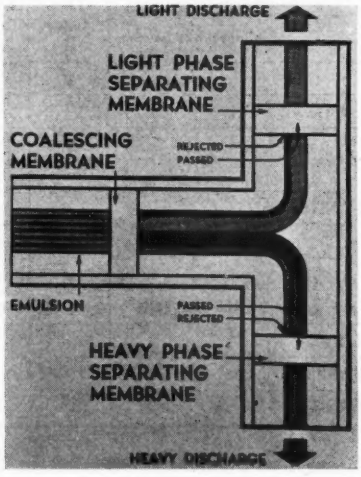
The new nozzle is being produced in various spray patterns and with flow rates from one-quarter gpm to 100 gpm.

Liquid Separator

Complete phase separation and recovery of liquids, including stubborn emulsions, is accomplished at production rates by the new liquid separator.

The new liquid separator produced by Selas Corp. of America, Erie Ave. and D St., Philadelphia 34, Pa., employs the physical principle of successive membranes, in which the first of the series has the function of coalescence and the second has the function of final separation. The controlled performance membranes permit rapid flow rates through the unit, from 500 to 1,500 gph with relatively low pressure-drops.

The natural division of the liquids by respective specific gravities, brings the heavier liquid into contact with permanently pre-conditioned separatory membranes that pass it and reject the lighter



liquid. The lighter liquid contacts other pre-conditioned separatory membranes as it rises to the upper section of the chamber and passes through. Finely dispersed droplets of the heavier liquid that reach the upper membranes are rejected and eventually fall to the lower chamber where they are passed.

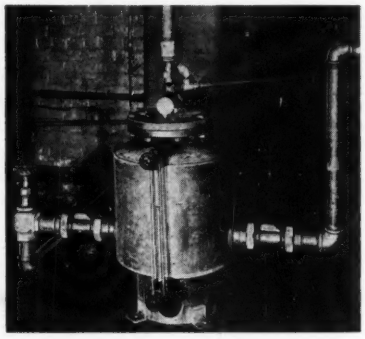
The shells of standard Selas Liquid Separators are constructed of carbon or stainless steel. The contemplated operating conditions finally determine the materials to be used in construction.

Emulsions usually encountered in chemical and pharmaceutical processes, such as steam distillations, solvent extractions, and organic reactions, can be separated by these units. Emulsions that are chemically stabilized by surface-active agents can not be separated. Solid contaminations, particularly of gelatinous nature, may cause abnormal pressure drops across the coalescing membranes.

Jet Pump

A two-part cycle enables a new cycling jet pump to lift by suction and discharge against heads nearly equal to the gas, air or steam pressure used.

The new cycling jet pump of Penberthy Injector Co., 1242 Holden Ave., Detroit 2, Mich., consists of a receiver tank, float-controlled operating valve, ejector and necessary piping, gauges and valves. Gas, steam or air under pressure



is used for operation. There are no moving parts other than the float-controlled operating valve and two check valves.

When the pump is turned on with the receiver empty, the float is in the lowest position. The gas, steam or air is directed into the ejector, creating a vacuum in the receiver. Liquid to be pumped is thus drawn into the receiver. As the receiver fills, the float rises, ultimately closing the control valve to divert gas pressure from the ejector to the receiver. This reverses pressure in the receiver, creating a positive pressure instead of a vacuum. The check valve in the inlet closes and the check valve in the outlet opens. Gas pressure now forces the liquid out of the receiver. When the receiver is empty, the float again actuates the ejector, starting a new cycle. The cycle is repeated as long as the operator desires and there is fluid to be pumped. 2" size is available from stock.

Insulation Products

Bigelow-Liptak markets mineral wool insulating block and high temperature insulating cements.

A complete line of high temperature

BEMIS paper bags for chemicals

As one of America's largest producers of multiwalls and other paper bags, Bemis naturally makes many types to serve varied packaging requirements.

For the chemical industry, several types of construction are produced. The paper bags most generally used are shown here.

Note the variety of the Bemis line when you are buying paper bags for chemicals. It gives you wider choice in quality bags from a single source.

Bemis

Peoria, Ill. • East Pepperell, Mass. • Mobile, Ala. • Houston, Texas
San Francisco, Calif. • Vancouver, Wash. • Wilmington, Calif.

Baltimore • Boise • Boston • Brooklyn • Buffalo • Charlotte • Chicago • Cleveland • Denver
Detroit • Indianapolis • Jacksonville, Fla. • Kansas City • Los Angeles • Louisville • Memphis
Minneapolis • New Orleans • New York City • Norfolk • Oklahoma City • Omaha • Phoenix
Pittsburgh • St. Louis • Salina • Salt Lake City • Seattle • Wichita

Here are essential facts on SUPER-CENTRIFUGE design operation application

THIS NEW BULLETIN provides a basic understanding of Sharples Super-Centrifuges and their applications in Industry.

Developing the highest centrifugal force commercially available—ranging upwards of 13,200 times the force of gravity—the Sharples Super-Centrifuge will raise the standards of performance . . . and perform previously impossible separations in your processing. With the application of this enormous force, immiscible liquids having extremely small differences in specific gravity can be separated . . . and solids as small as 2 microns in diameter can be removed.

The Super-Centrifuge is an important part of the Sharples *complete line of centrifuges* which are increasing the scope and lowering the costs of industrial processing today.

The informative data in this new bulletin should prove profitable to you. Write today for your copy.

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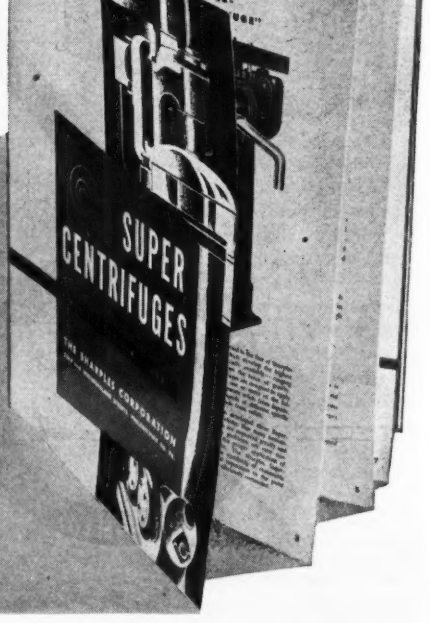


THE SHARPLES CORPORATION
2306 Westmoreland St., Phila. 40, Pa.

Please send me Bulletin No. 1248 on Super-Centrifuges.

Name.....**Title**.....

Company.....

Street Address.....

City .....**State**.....

insulation products is now being produced by Bigelow-Liptak Corp., 2842 W. Grand Blvd., Detroit 2, Michigan.

A mineral wool all-purpose block, for temperatures to 1700° F., BL-17, has a density of 1.67 pounds per board foot. It is chemically inert, and does not disintegrate or cause rust or corrosion. BL-17 will be available in standard sizes.

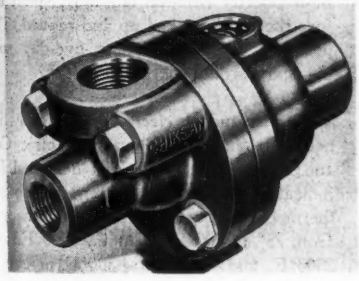
C-18, a companion product to block, is an insulating cement composed of mineral wool, long fiber asbestos, and an adhesive binder. It is applied like a plastic; 100 pounds of C-18 will cover 50-55 board feet. The product is effective to 1800° F. and contains a special inhibitor to prevent rust and corrosion. It is reclaimable.

Others in the line will be an insulating cement good to 2300° F., finishing cement, pipe covering, mineral wool blankets, loose fibrous and granulated mineral wool, protective coatings for insulation surfaces, and an insulation block adhesive.

Rotating Joint

New joint resists temperature and handles 150 psi steam at 150-300 rpm.

The new rotating joint of Chiksan Co., Brea, Calif., will handle steam, hot water, hot oil, brine and other cold fluids. Turning takes place on stainless steel balls. Sealing surfaces have hard chrome plating for long wear, while cadmium plating inside and out resists rust and corrosion. There is nothing to tighten or adjust. It is equally effective in constant or intermittent service. Available now in 1", 1½", and 2" sizes.



Forged Valves

New values stand 6000 psi and are small enough to fit in limited space.

New forged steel instrument valves built by Edward Valves, Inc., E. Chicago, Ind., are particularly suitable for small lines in petroleum and chemical processing plants. They are small enough to fit into very limited spaces and yet can withstand pressures as high as 6000 psi.

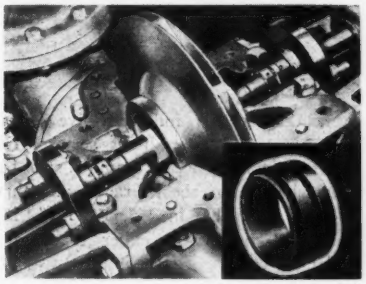
Constructed of carbon steel, 13% chromium stainless steel, or 18-8 stainless steel, these new instrument valves are now available in globe or angle design in ¼", ⅜", and ½" sizes with screwed or socket welding ends. They have outside screw and yoke construction and the yoke is screwed onto the body and tack welded. The carbon steel valves are rated as 1500 psi at 850° F. and the 13% chromium and 18-8 stainless steel designs are rated at 1500 psi at 1000° F. WOG rating for all of these valves is 6000 psi at 100° F.

Carbon Seal

A new self-lubricating mechanical seal has been developed, which is capable of withstanding corrosive chemicals.

The new carbon seal of Morganite, Inc., 3302 48th Ave., Long Island City, N. Y., offers a perfect seal for highly volatile fluids under high pressures and at high shaft speeds.

Morganite carbon seals are mechanically strong and are free from warping and gumming. Entirely self lubricating, they require no attention for lubrication during the life of the seal.



Self-lapping and self-polishing, Morganite imparts a corrosion resistant coating too, and actually polishes participating surfaces. Pressure seal units of Morganite are available with self adjusting and wear compensating features which, combined with self lubricating properties, reduce servicing and repairs to a minimum.

Packing Material

New chemically inert packing material is now available in molded form in a wide variety of shapes.

In the new molded form, Chemlon, marketed by Crane Packing Co., 1800 Cuyler St., Chicago, Ill., retains all of the chemically inert properties of the familiar braided packing. It is not attacked by any acids or alkalis, and stands up for long periods of time under conditions never before successfully sealed by packing. It is effective to temperatures of 450° F. Its high flexibility is particularly helpful in installation of the packing rings. When split, they can be twisted and placed directly on the shaft without the necessity of completely removing the gland.

Among the many molded forms now furnished are washers, bushings, rings, self sealing "V" crossection rings, ring gaskets, and jacketed (French) gaskets.

LOOK WHAT'S HAPPENING
on the Texas Coast

$10 MILLION IN STEEL MILLS IN 10 DAYS

That's what Houston got in September. A. O. Smith and Sheffield Steel first announced start of a $5 million plant to produce 360,000 tons or more of steel pipe a year. A few days later U. S. Steel subsidiary, Consolidated Western Steel Corporation, announced construction of its $5 million plant on a 78-acre site near the Ship Channel. New plants are needed to supply the Gulf Coast's constantly growing oil, gas and chemical needs.

☆ ☆ ☆

NEW WAX WORKS FOR HOUSTON

Shell Oil Company recently completed a new plant where 75 million pounds of high-purity wax will be produced each year. Raw material will be crude wax, by-product of manufacture of lubricating oils. Finished products will be used in making milk cartons, bread wrappers, candles, cosmetics and other products.

☆ ☆ ☆

TALL TALE, BUT TRUE

Non-inflammable gas—known as helium—which is used in balloons is produced at Amarillo. An Easterner, visiting in Houston, mentioned that his tour would include Amarillo.

"You want to be sure to see the helium plant there—it's the only one in the world," someone said.

"Thanks for telling me about that plant; I surely hope it's in bloom while I'm there," the Easterner replied.

☆ ☆ ☆

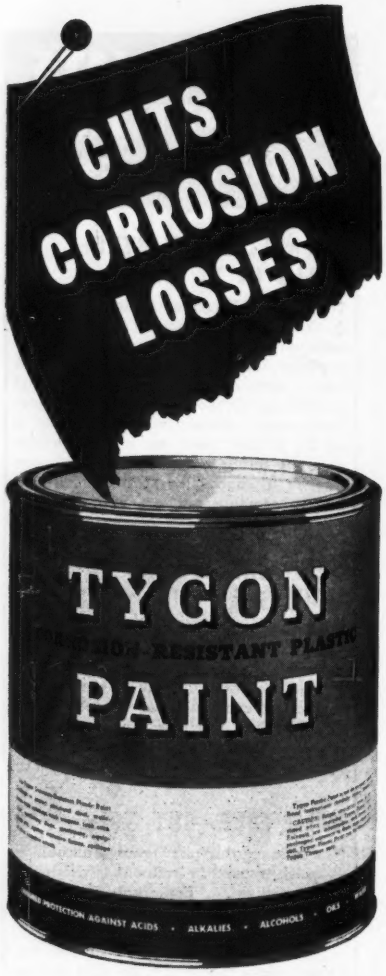
CHEMICALS ARE TEXAS-MINDED

. . . and no wonder—for the Texas Gulf Coast offers the chemical industry everything it needs for successful, profitable operation — good weather, good transportation, ample labor supply, available sites and most important, unlimited supplies of acids, bases, fresh water and cheap natural gas for fuels and hydrocarbons. These are good reasons why your industry can profitably FOLLOW THE TREND TO TEXAS.

☆ ☆ ☆

To help you find out more about the area we serve, we will gladly: (a) make a survey engineered to your company's needs; (b) supply you with any special information you require; (c) show you the coast country from Sabine to Rio Grande rivers — all in strictest confidence. Write, wire or telephone the Houston Pipe Line Company, Houston, Texas.

HOUSTON PIPE LINE CO.
Subsidiary of Houston Oil Company of Texas
Wholesalers of Natural GAS



TYGON plastic Paint protects metal, concrete and wood from attack by acids, alkalies, oils, fresh or salt water. Tough, flexible film resists impact. Non-contaminating to solutions.

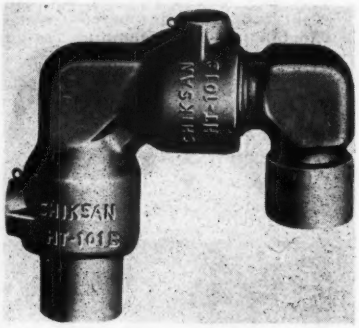
• ***Write for Test Samples***

U. S. STONEWARE
Akron 9, Ohio

Swivel Joint

New joint available in eight styles for 360°, turning in 1, 2, or 3 planes.

All-steel lines with unlimited flexibility can be fabricated to handle steam and other fluids by installing these new high temperature swivel joints in any desired sequence. The new joints produced by Chiksan Co., Brea, Calif., are built to operate at temperatures up to 600° F. and working pressures up to 300 psi. The



metallic seal is fully effective in both constant and intermittent service. Easy turning takes place on stainless steel balls which help to absorb radial and thrust loads. Available in ¾", 1", 1¼", 1"½, and 2" sizes with either threaded or flanged ends.

Control Valve

New control value features quick reversibility.

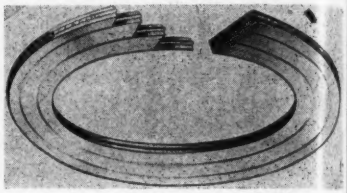
The design of the new air-operated control valves makes possible the quick reversibility of action in the Stabilflo valve of Foxboro Co., Foxboro, Mass. In a few minutes' time and without the use of spe-

cial tools the new valve can be changed from "air to open" or "air to close," or vice versa; and it is not necessary to remove the valve from its installation or to shut down the controlled flow.

The new reversible motor, with its forged steel motor housing the new reversible motor, is similar in general appearance to the conventional Stabilflo valve. To reverse the action of the valve motor it is only necessary to remove the housing assembly, rotate it one quarter-turn, and replace it. This merely requires the removal and replacing of four bolts, which is easily done with an ordinary wrench.

• A new *flexible all-metal gasket* for high pressure and high temperature applications is now being produced by the Flexitallic Gasket Co., Camden, N. J.

In a number of applications, it has been found that the new all-metal gasket



does not take the permanent "set" customarily expected with solid metal gaskets. Flexitallic's spiral-wound feature is used in the new all-metal gasket. Several types of ferrous and non-ferrous metals are used in combination.

• A *solenoid-actuated pen* which avoids ink-throwing while providing speedy recording has been developed for use on circular chart electronic potentiometers by Brown Instruments division of Minneapolis-Honeywell Regulator Co., Wayne and Roberts Ave., Philadelphia, Pa.

The new operation pen, in field test for several months, makes use of an amplifying linkage designed so that the solenoid's high velocity reaction is almost spent before the pen is picked up and moved. The pen is a V-type, holding a five-day supply of recording ink.

• A new model *electric pyrometer* has been introduced by Thermo Electric Co., Inc., Fair Lawn, N. J. It is designed for indicating temperatures from one to six thermocouple locations at operating ranges from 75° to 400°F., 1000°F., 1600°F. and 2300°F., and —300° to +300°F. or equivalent centigrade scales.

Calibrated for Iron Constantan, Chromel Alumel or Copper Constantan, this model 10252 Indicator Assembly is automatically compensated for cold junction temperature changes and instrument temperature resistance coefficient. The instrument scale is 3.17 inches long and movement is housed in a removable Bakelite case. An important feature of this indicator is its specially constructed movement to provide accurate readings for these low temperature ranges of 75° to 400°F. and minus 300° to plus 300°F.

• Goggle Parts Co., 1468 W. Ninth St., Cleveland, Ohio, has developed a new product—Flex-a-Foam *filter masks* for protection against non-toxic nuisance dusts. The mask weighs only one ounce, and is extremely simple in construction, consisting of only four interlocking parts. The filter is a honeycomb construction of whipped foam latex ventilated by hun-

ORONITE CHEMICAL COMPANY

THE NAME TO WATCH IN CHEMICALS

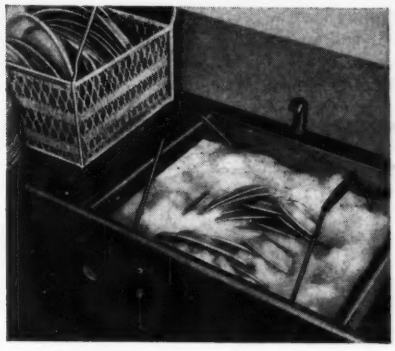
D-40 DETERGENT GIVES FAST ACTION, QUICK PENETRATION, EASIER RINSING

There's plenty of power in the surface activity of D-40 Detergent. Whether you have hard water or soft, this remarkable product gives excellent performance in extremely low concentrations.

With D-40, new economies are now possible in many washing and cleaning operations. A leader among detergents, it is also highly effective as a wetting agent, foaming agent and surface tension depressant.

Quick solubility, shorter wetting times, exceptional stability, easier rinsing, are a few advantages of D-40 Detergent.

If you need detergents for compounding ...processing...or manufacturing...call the Oronite office nearest you.



A typical example of improved washing methods is the use of D-40 to loosen grease and food particles from dishes and silverware in dishwashing operations.

The high surface activity and grease emulsifying properties of D-40 quickly remove protein and other foods from soiled surfaces. This outstanding detergent works well with many sterilizing agents and helps eliminate the breeding grounds of harmful bacteria.

In controlled washing operations with hard or soft water and varying temperatures, D-40 will improve the wash at lower cost.

ORONITE CHEMICAL COMPANY

38 SANSOME STREET, SAN FRANCISCO 4, CALIFORNIA
STANDARD OIL BLDG., LOS ANGELES 15, CALIFORNIA
30 ROCKEFELLER PLAZA, NEW YORK 20, NEW YORK
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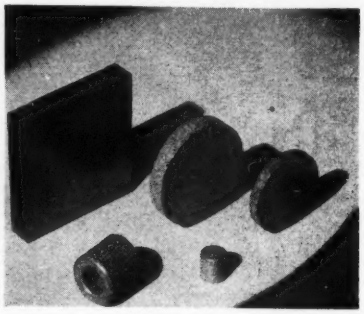
dreds of tiny interconnecting cells that allow the passage of air but keep out non-toxic nuisance dusts as small as 1/25000 of an inch. Inner and outer frames are of polythene, so flexible they adjust themselves to the contours of any face. Flex-a-Foam's headbands are molded of natural rubber of a non-toxic, non-irritating quality. All parts can be sterilized by washing in warm, soapy water and immersing in a mild formaldehyde solution.

• Improvements on two Quick Aid *fire extinguishers,* one for foam and the other for soda-acid charge, have been made by the manufacturers, The General Detroit Corp., Detroit 32, Mich., and The General Pacific Corp., Los Angeles 21, Calif. The two new models more than meet the Underwriters' Laboratories 500 lb. pressure test.

A special feature of the extinguishers is the seamless drawn shell of Nilite bronze, made entirely without rivets, welds, or solder from dome to base. A major improvement is the forged collar which combines greater lightness with increased durability and pressure resistance.

The Quick Aid Hi-Test Soda-Acid extinguisher bears the Underwriters' Classification of A-1, and is approved for use on wood, paper, textile, and rubbish fires. Quick Aid Hi-Test Foam extinguisher bears Underwriters' Classification of A-1, B-1, and is approved for oil, gasoline, paint and similar flammable liquid fires, as well as wood, paper, and textile fires.

• The Amplex Mfg. Co., powder metallurgy division of Chrysler Corp., Detroit 31, Mich., is now equipped for production of permanent Oilite *stainless steel filters.* They are extremely efficient for filtering,



separating, diffusing, and regulating the flow of a variety of liquids and gases.

Typical shapes produced include discs, sheets, plain cylinders, and cones. Special shapes are built to fit customers' product designs.

Porosity or permeability, which may range from nearly zero to more than 60 per cent depending upon the application, is closely controlled.

• A completely new line of *air-operated valves* for process control is offered by the Fischer & Porter Co., Hatboro, Pa., in sizes from 3" through 12". Advantages claimed are . . . great strength, lightness, compactness, convenience and accessibility. The entire assembly is installed in the line with only one set of through-bolts . . . 125-lb. drilling is standard. Accessibility is good because face-to-face dimensions are small.

Valve bodies are available in carbon steel, bronze, 316 stainless steel, and other materials including plastics: vane is 316 stainless, fitted with rubber seal when required. Static line pressures up to 125 psig and differential pressures up to 50 psig can be handled. Standard "Rato-Vane" butterfly valves are supplied with hand jack screws, air operated diaphragms, and valve positioners.

• Stonhard Co., 1306 Spring Garden St., Philadelphia 23, Pa., is now introducing Stonhard Stoncote, an *acid-resistant coating* for floors, walls, machinery, etc. Stoncote is not an ordinary paint. It is a special plastic formula. It is a protective coating that can easily be applied to all maintenance areas or wherever corrosion is a special problem. It may be applied with either a brush or a spray and it will dry in from one-half to one hour under ordinary temperatures. It is available in five colors, as well as

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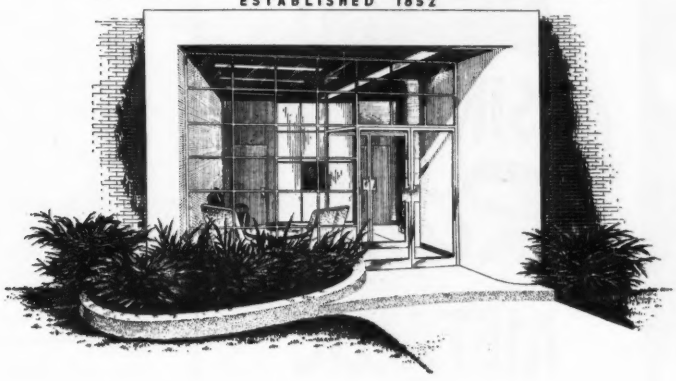

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Adjacent to the air conditioned general offices are located the city sales room, lecture and projection room, cafeteria with kitchen, scientific library and display room. All facilities are coordinated for expanded service to our customers. You are invited to visit us when in Chicago.

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If you are in doubt or would like to try another style weave, write us in detail about your filtration step. We make all five of the standard weaves mentioned above. We are in position to turn out special weaves, if necessary. And we make cloth from all malleable metals, including the noble metals.

All Newark Metallic Filter Cloth is manufactured in a wide range of meshes. It is available in rolls, cut and gasketed to fit your filter presses, or made up into filter elements. We have large stocks of standard weaves on hand to make prompt shipment.

NEWARK for ACCURACY

Newark Wire Cloth COMPANY

345 VERONA AVENUE • NEWARK 4, NEW JERSEY

in black, white, transparent, and aluminum.

• The Fischer & Porter Co. is producing a new *threaded metal coupling*, for use with Pyrex glass pipe lines. The new coupling simplifies installation of glass piping by replacing three-bolt triangular metal flanges. The use of wrenches is no longer necessary and perfect alignment is assured. Danger of breakage due to uneven take-up is eliminated. Installation time is reduced up to 60% in comparison with alternate methods. Metal couplings are available from stock in sizes ¼", ½", ¾", and 1" for making glass-to-glass or glass-to-metal connections.

LABORATORY EQUIPMENT

Laboratory Spray Dryer

New laboratory spray dryer gives a parallel performance to large production units.

A portable spray-drying unit is being made available by the Niro Corp., 52 Broadway, New York City.

This compact laboratory unit may be easily wheeled from one department to another. Its performance is parallel with

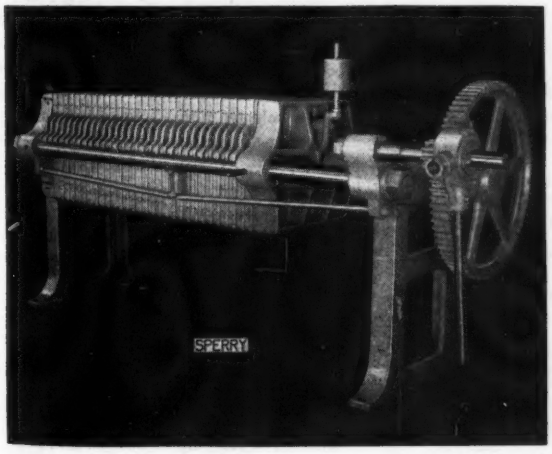
that of the large production Niro units.

The new laboratory spray drier features a specially designed, high-speed atomizer head, which rotating at 50,000 RPM, ejects the liquid product as an extremely fine mist into the drying chamber, where circulating warm air instantaneously evaporates the water content. The dry product falls to the bottom of the chamber as a fine powder, where it is funnelled out as a finished, easily soluble product.

The new portable unit is constructed of stainless steel and glass, making it particularly suited for conducting test runs on a wide variety of materials. It features a compact control panel and an eye-level window in the drying chamber, which has

Flexibility...

AN EXTRA VALUE IN THE SPERRY FILTER PRESS



Flexibility, as applied to the Sperry Filter Press, gives you these definite advantages . . . all important factors in the purchase of process equipment:

Efficient operation under many varying conditions.

High, medium or low pressure filtration.

The use of any filter medium.

The handling of any filterable mixture (including viscous), either hot or cold with precise temperature control if required.

Add ECONOMY (low first cost, low maintenance), SIMPLE CONSTRUCTION (easy to install, easy to operate) and UNIFORMITY OF PRODUCT . . . and you have the reasons behind universal acceptance of the Sperry Filter Press. Sperry engineers are always available to help put these advantages to work for you. Call on them today!

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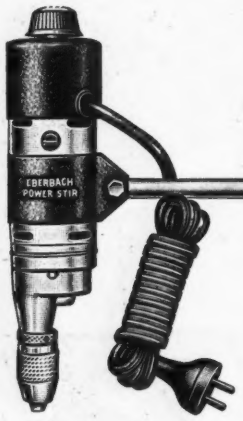
SPERRY FILTER PRESSES



POWER-STIR

LABORATORY STIRRER

HIGH TORQUE
VARIABLE SPEED
#77-836 $24.50

Ask your dealer or us for literature on the Eberbach Power Stir, the reliable high torque variable speed laboratory stirrer. Speed range without load is 500 to 2400 r.p.m.; plastic knob controls speed and built-in off-on switch. Handy mounting rod 9" long by ½" makes it easy to adjust on any support. 1/20th H.P. motor develops high torque through 17 to 1 gear reduction. Weight, 4 pounds; height, 10½". #77-837 stainless steel stirrers have 2" propellers with ¼" shafts 12" long ($2.25 ea.), 18" long ($2.50 ea.) and 24" long ($2.75 ea.). Write for literature today.

Eberbach & Son Company
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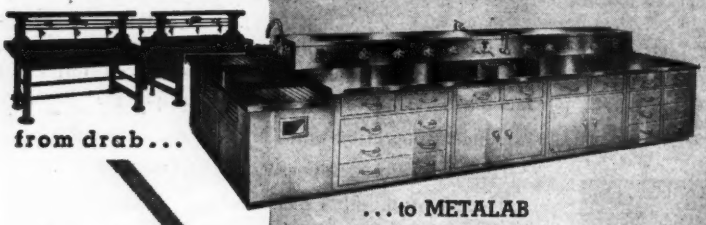

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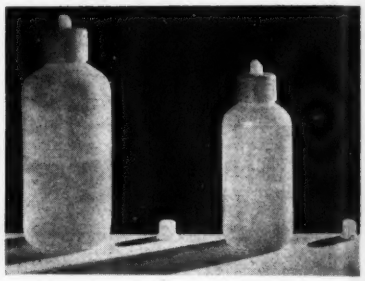
a top easily removable for cleaning. Its capacity is 2-15 lbs. of water evaporated per hour—depending on the material and temperature applied to the drying air.

Wash Bottle

One hand operation of new polyethylene wash bottle is possible.

A new, all plastic wash bottle is now available for laboratory use. Made entirely of flexible polyethylene plastic, a gentle squeeze of the bottle will eject a strong easily controlled stream of fluid.



One hand operation offers a decided improvement over previous types, according to Meyer Scientific Supply Co., 221 Atlantic Ave., Brooklyn 2, N. Y.

Polyethylene has been found to be the ideal plastic for this purpose because of its high resistance to corrosion. Breakage is eliminated because the bottle cannot break or crack if it is dropped.

Three bottle capacities are available: 125 ml, 185 ml, and 250 ml.

• E. Machlett & Son, 220 East 23rd St., New York 10, N. Y., are now offering an entirely new type of *filter colorimeter*. It represents a departure from the ordinary, pre-calibrated or visual colorimeter. Among many new features embodied in this instrument are: 1. Scale panel calibrated in both transmission and density, and removable for insertion of other panels calibrated by the analyst to read directly for any particular analysis. 2. Specially selected filters covering visible spectrum in six uniform increments of spectral purity. 3. Selection of cuvettes from 25 mm. depth to capillary size. 4. A photocell operating at extremely low sensitive levels insuring better linearity, freedom from cell fatigue and accompanying drift.

• A high-pressure *insertion-type conductivity cell* is available from Industrial Instruments, Inc., 17 Pollock Ave., Jersey City 5, N. J. The new cell is equipped with a 1¼" bronze gate valve removal device for service up to 300 psi and 200° F. A yoke is supplied for safety in removing element under line pressure. It is provided with platinized electrodes and a ceramic insulator, and is available in cell constants 0.01 and 0.1. This type cell is also available with built-in automatic temperature compensator.

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5770

PACKAGING & SHIPPING

by T. PAT CALLAHAN

Bulk Handling of Chemicals Becomes Major Shipping Trend

THE TREND toward unit packaging of large quantities of materials is becoming more pronounced in the chemical industry. Particularly is this true in shipping liquid products which formerly moved in carboys and drums with a maximum capacity of 110 gallons. The recent approval granted by the Interstate Commerce Commission for the use of portable skid tanks (covered in recent amendments to the Interstate Commerce Commission Regulations) is one further step in the direction of more tank shipments of chemicals.

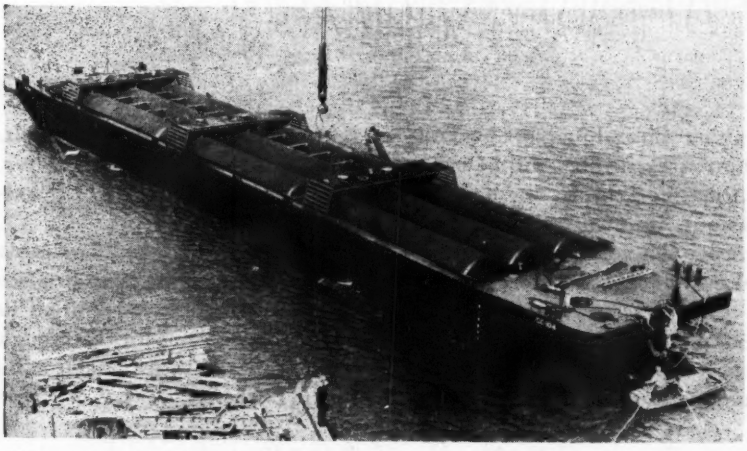
Three separate means of shipping chemical liquids in large unit loads are tank trucks for highway transport, tank cars for rail shipments, and portable tankers or tank barges for movement by water. Various types of tank cars are currently approved for the movement of chemicals by rail. Some of these are plain steel tanks, rubber-lined steel tanks, nickel tanks, aluminum tanks, tin-lined tanks, lead-lined tanks and several tanks coated with various synthetic coatings.

The significant increase in tank car movement of various chemicals is due mainly to the economies achieved by handling large quantities of materials in a few tank cars rather than in a great number of drums or carboys. For shorter hauls, tank trucks offer the same economies as tank cars, and this method of shipping is increasing very rapidly in the chemical industry.

Tank trucks having the tank as an integral part of the truck assembly have been approved for various chemical commodities for several years. Now that the Interstate Commerce Commission has approved Specifications ICC 51 and 60 for skid tanks, larger units of hazardous chemicals can be loaded in tanks on skids and placed in the body of a conventional truck. On short hauls, carrying chemicals in tank trucks eliminates the handling of the smaller container and has definitely been responsible for savings to both the producer and consumer.

For large volume water movement, the shift to large tanks or barges and tankers for intercoastal movement has increased as witnessed by the large volume movement of chemicals from the Southwest to many points both inland and along the East coast. This method of moving large quantities of liquid materials is increasing tremendously as water transportation has always been the cheapest method of hauling cargoes.

Carbide & Carbon Chemicals Corp. and The Dow Chemical Co. are among large chemical companies shifting to tankers (*CI Newsletters, Sept.* and *Oct., 1949*). Carbide will ship methanol, acetone, *n*-butyl alcohol, ethyl and butyl acetate, and ethylene glycol from its Texas City, Tex., plant to Carteret, N. J., in a 15,000-ton converted T-2. A 13,000-ton tanker (fittingly called the *S. S. Marine Chemist*) will haul Dow's caustic soda, glycols, and solvents from its Freeport, Tex., plants to the eastern seaboard. Terminal facilities have also been constructed at Carteret, and at other nearby points as well. Some dry cargo will also be shipped.



More evidence of the trend to bulk shipment of chemicals: one of the new chemical barges built by the Ingalls Shipbuilding Corp. afloat on the Tennessee River. Its nine high-pressure tanks have a combined capacity of 234,000 gallons of liquid chemicals. They may be mounted permanently or made removable in the open hopper type barge. For coastwise or open water service, the tanks may be installed below deck.

New Label Coder

All bottle labeling machines may be made into fully automatic coding machines through use of the Hampden Label Coder, a newly developed device being marketed by Holyoke Production Machine Corp, Holyoke, Mass. It may be

applied to labelers now in use or may be ordered, factory-installed, with new equipment.

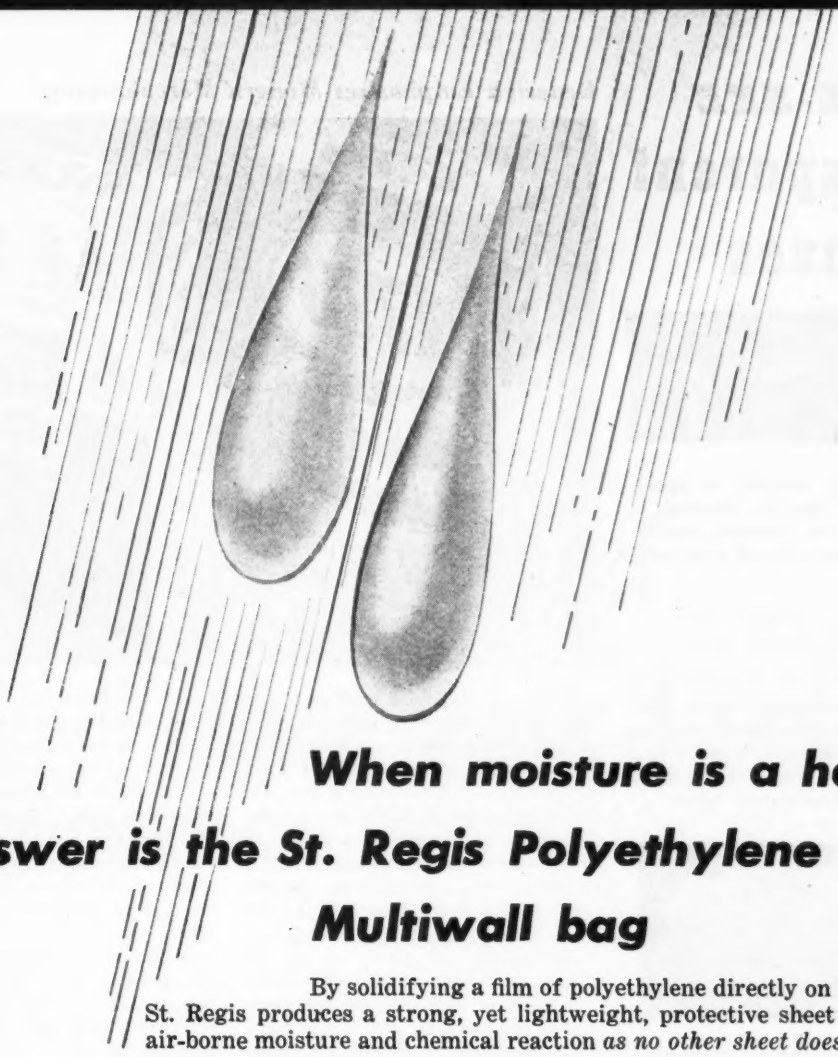
An easily adjustable arm carries the numbers to the stack of labels in the machine in the interval between successive swings of the gummer fingers. It is a quick motion which makes sure identification of the mix or batch from which every bottle is filled.

Chief claim for the machine is its simplicity. A squirt of special ink twice a day puts the roller in condition to keep fresh ink on code numbers as they are printed on the back of labels.

New Manual Covers Loading Platforms

To fulfill the need for information on the proper type of approach platform for loading and unloading tank cars safely, the Manufacturing Chemists' Association has published Manual Sheet TC-7, Tank Car Loading and Unloading Platforms. It is the seventh in the M.C.A. tank car series and outlines definite recommendations regarding the type of approach platform which should be used. The manual attempts to supply this information by describing and illustrating types of platforms already in widespread use by chemical manufacturers and processors.

It may be obtained at 20 cents per copy from the Manufacturing Chemists' Association, 246 Woodward Building, Washington 5, D. C.



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It is also more acid resistant, more alkali resistant and more grease proof; it does not bleed at higher packing temperatures nor crack, even at very low temperatures. It has greater strength, is non-toxic, tasteless and odorless.

Used as a ply in the Multiwall, this sheet affords superior protection to chemicals, food products, hygroscopic materials of all kinds. That's why manufacturers are now using St. Regis Polyethylene Multiwalls for such items as:

- Asphalt Sealing Compounds
- Beta Naphthol
- Brown Sugar
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- Cellulose Acetate
- Compost
- Detergents
- Meat Trimmings
- Mono Sodium Phosphate
- Polyethylene
- Powdered Milk
- Quick Lime
- Urea Resin

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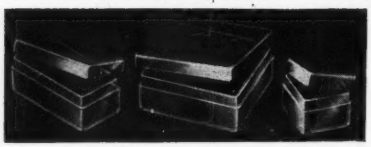

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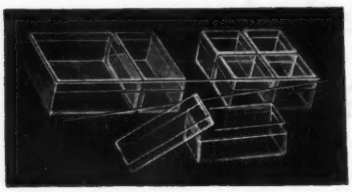
Can be carried in salesman's sample case.

Can be stacked in the laboratory with contents completely visible. Can be used to keep small parts in order —and visible. Fine for protecting fragile specimens. You will find many uses for these transparent boxes.



Separate boxes can be assembled in transparent cases for convenience in handling groups of samples.

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Redesign Emphasizes Modern Merchandising

Modern merchandising design was emphasized by Robert Sidney Dickens & Associates, Chicago designers, in the redesign of Armour & Co.'s 1776 Soap Powder package (see accompanying cut). The oval shape on the top half of the package, enclosing the 1776 logotype, was repeated on the bottom half of the package giving an added bull's eye effect for product identity and a strong focal point for the eye to center on (left).

Whereas the side panels on the old package contained nothing but monotonous appearing sales copy, the side panels on the new package are broken by a middle line giving solidity of appearance and stronger display value. The top half of the side panels carries the 1776 logotype reversed on a dark panel for positive product identity on the side as well as on the front of the package.

The back of the package (right) again emphasizes 1776 in another reverse panel. The back panel on the top half displays six illustrations demonstrating uses of the soap powder while the bottom half gives instructions in highly legible reverse lettering.

The colors of red and black, used in the old package, were utilized in the new package but on a better grade of white stock for cleaner and sharper reproduction and to better project the feeling of cleanliness for this heavy duty soap.

ICC Regulations Amended

The Interstate Commerce Commission on September 21, 1949, amended the Regulations for the Transportation of Explosives and Other Dangerous Articles. Several of these amendments are of particular interest to the chemical industry, and they are listed and discussed below for the benefit of chemical shippers.

Two new containers referred to as "portable tanks" have been approved by the Commission. The term "portable tank" means any tank designed primarily to be temporarily attached to a motor vehicle, other vehicle, railroad car other than a tank car, or vessel, and equipped with skids, mountings or accessories to facilitate handling the tank mechanically.

Two specifications, namely ICC 51 and ICC 60 were approved. Specification ICC 51 is an unlagged steel portable tank and Specification ICC 60 is a steel portable tank. Of particular interest to the heavy chemical manufacturer is Specification ICC 60 because this specification portable tank allows the shipment of corrosive liquids which can be loaded and secured. The Interstate Commerce Commission has specified certain chemicals which are immediately permissible for shipment in ICC 60 portable tanks listed as follows:

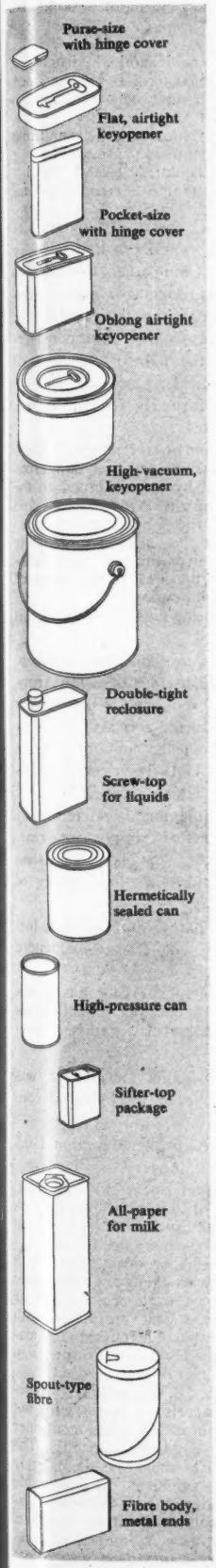
Acetyl chloride
Antimony pentachloride
Benzoyl Chloride
Pyro sulfuryl chloride
Silicon chloride
Sulfur chloride (mono and di)
Thionyl chloride
Tin tetrachloride (anhydrous)
Titanium tetrachloride

Note: Benzoyl chloride must be stabilized when loaded in unlined tanks.

Acid sludge
Sludge acid
Spent sulfuric acid
Spent mixed acid

Note: Acid sludge, sludge acid, spent sulfuric acid or spent mixed acid, resulting from the use of sulfuric acid in various processes, except when containing hydrofluoric acid, which will not corrode interior of tank cars at sufficient rate to cause leakage during transportation.

Caustic soda, liquid
Caustic potash, liquid



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Canco can help you with cost-cutting, sales-building advice on packages, processes, filling and closing. Canco stands ready to serve you promptly in production-line emergencies. From Canco you get as many containers as you need when you need them. Let's get together!

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Electrolyte (acid, not over 47% strength, 39° Baumé), unlined tanks not permitted.

Formic acid

Hydrochloric acid and hydrochloric acid mixtures, when tank is rubber lined.

Mixed acid (in same concentrations as allowed for tank cars).

Phosphorus oxychloride, Phosphorus trichloride, Thiophosphoryl chloride } These tanks must be lead lined

Sulfuric acid (same strength as for tank cars).

The addition of portable skid tanks to the specification containers approved by the Interstate Commerce Commission makes possible movement of many chemicals in larger quantities than carboys or metal drums and should effect considerable savings to the industry in methods of shipping chemicals.

Section 73.16, formerly section 16, was amended as follows:

U. S. Government shipments. Shipments of explosives or other dangerous articles offered by or consigned to the Departments of the Army, Navy, and Air Force of the United States Government must be packed, including limitations of weight, in accordance with these regulations or as required by their regulations.

It also strikes out Note 11 (b) to this section.

The purpose of this amendment was to incorporate the Departments of the Army, Navy and Air Force in place of the War or Navy Department, and also to strike out a note authorizing containers to an agency of the United States Government or of the United Nations.

Section 103 Inflammable (flammable) liquids was amended simply for rearrangement purposes to make consistent with similar sections in other groups of dangerous articles.

Section 73.110 paragraph (b) (7), formerly section 110, (b) (7), was amended as follows:

(b) (7) Spec. 12E. Fiberboard box with 1 or 2 rectangular metal inside containers of not over 5 gallons capacity each.

The purpose of this amendment was to clarify the type of inside metal containers authorized.

Section 73.110A, formerly section 110A was amended as follows:

73.110A *Lithium aluminum hydride, ethereal.* (a) Lithium aluminum hydride, ethereal, must be packed in specification containers as follows:

(1) Spec. 15A wooden boxes with inside glass or earthenware containers not over 1 quart each enclosed in air tight metal cans and cushioned with sufficient incombustible cushioning material to completely absorb contents in event of breakage.

(2) Spec. 6A, 6B, 6C, or 17H (single-trip). Metal barrels or drums with not more than one inside glass container not exceeding 2 gallons capacity. The inside container must be completely cushioned in sufficient incombustible cushioning material to completely absorb the contents in event of breakage.

(3) Specification cylinders as prescribed for any compressed gas except

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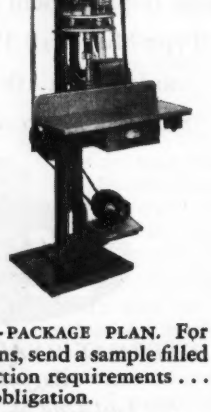

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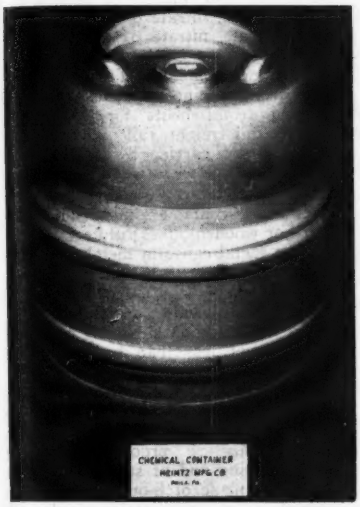
7317

New Nitric Acid Drum



New type bilge drum for shipment of nitric acid recently approved by the Interstate Commerce Commission. Made of 16-gauge steel type 304 with a closure of 304 stainless steel, the drum has a capacity of 15 gallons and a tare weight of 24 pounds.

acetylene. Valves or fittings must be protected from injury by a cap or equally efficient device.

The purpose of this amendment is to provide additional suitable containers for this product.

Section 73.182 paragraphs (b), (c), and (d), formerly section 182 paragraphs (b), (c), and (d), are amended as follows:

(b) (1) In bulk or in bags in clean closed cars which shall be free of loose boards, cracks, holes, or exposed decayed spots. Interior of cars must be swept clean and free of any projections capable of injuring bags. Doors of cars must have tight closure. Journals and boxes must be in good condition. Ammonium nitrate, ammonium nitrate fertilizer, or guanidine nitrate must not be shipped in all metal cars.

(b) (2) In bags in closed or open type motor vehicles which must be swept clean and free of any projections capable of injuring bags. Ammonium nitrate, ammonium nitrate fertilizer, or guanidine nitrate must not be shipped in all metal motor vehicles of the closed type. Nitrates, including ammonium nitrate, ammonium nitrate fertilizer, or guanidine nitrate when transported in open type motor vehicles shall be suitably covered.

(c) In bulk or in bags on freight vessels subject to the Regulations for Explosives or Other Dangerous Articles on Board Vessels prescribed by the Commandant United States Coast Guard.

(d) In containers as prescribed in sec. 73.183.

Note.—Nitrates of soda in bulk (not in containers) in cars, and in bags may be shipped in the same car.

Section 73.183, formerly section 183 is amended as follows:

73.183 *Exemptions for nitrates.* (a)

ACID BORIC USP
ACID PYROGALLIC USP
ACID TANNIC USP
CALOMEL USP
CHINIOFON USP
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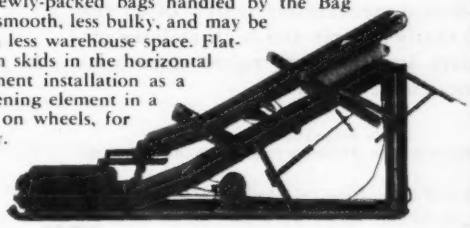

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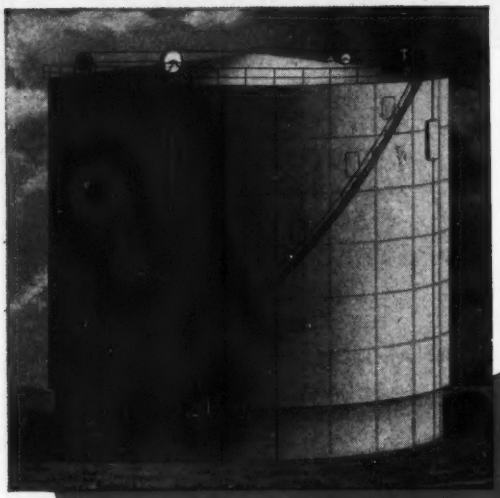

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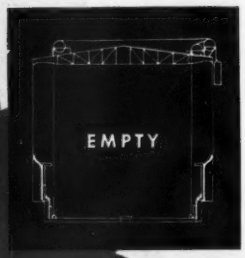

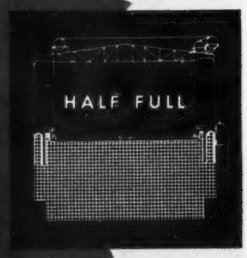

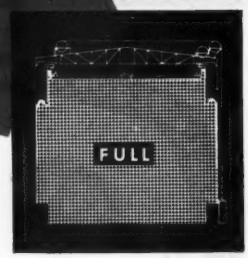

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Nitrate of aluminum, nitrate of barium, nitrate of lead, nitrate of potash, nitrate of soda, nitrate of strontia, nitro carbo nitrate, nitrate of ammonia, nitrate of ammonia fertilizer, calcium nitrate and guanidine nitrate are exempt from specification packaging and labeling requirements for transportation by rail freight, rail express, highway and by carrier by water when packed as follows:

(1) In metal cans, glass bottles, or other inside containers in outside fiberboard or wooden boxes; in kegs or barrels; in metal cans; in metal drums or fiber drums; calcium nitrate or nitrate of soda in bags not exceeding 200 pounds net weight, moisture proof, made tight against sifting and of strength not less than bags made of 8-ounce burlap.

(b) Ammonium nitrate, ammonium nitrate fertilizer, and guanidine nitrate in bags not exceeding 200 pounds net weight, moisture proof, made tight against sifting and of strength not less than bags made of 8-ounce burlap are exempt from specification packaging requirements for transportation by rail freight, rail express, highway and by carrier by water.

The purpose of amendment 73.182 and 73.183 is to clarify the shipment of nitrates and to provide for the shipment of calcium nitrate or nitrate of soda in bags not exceeding 200 pounds net-weight without labels.

Section 73.247 (j), formerly section 247 (j), has been amended as follows:

(j) Spec. 5K. Nickel drums, authorized for acetyl chloride, benzyl chloride, benzoyl chloride, pyro sulfuryl chloride and thionyl chloride only. When shipped in unstabilized condition, the lading must be anhydrous and must be free from impurities such as iron.

The purpose of this amendment is to provide nickel drums for the shipment of the above products.

Section 73.249, formerly section 249, has been amended as follows:

(e) (2) Inside containers of not more than 8-fluid ounces capacity each, resistant to lading, packed in strong outside containers, and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in the event of breakage, are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

(e) (3) Spec. 60. Portable tanks marked "For Caustic Soda, Liquid, Only," or "For Caustic Potash, Liquid, Only."

(k) Spec. 12B. Fiberboard boxes with inside containers of polyethylene, or other material resistant to lading, capacity not over 16 ounces each, adequately cushioned against breakage.

(1) Inside containers of not more than 8-fluid ounces capacity each, resistant to lading, packed in strong outside containers, and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in the event of breakage, are exempt from

(*Turn to page 822*)

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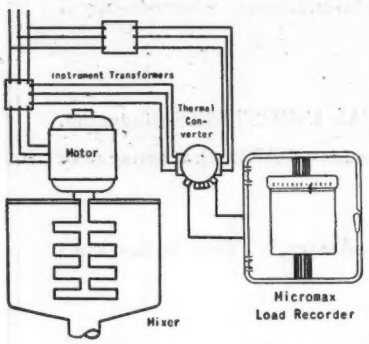
PLANT OPERATIONS NOTEBOOK

Viscosity Determination

Power input to electric motor power source for mixer is indirect measure of viscosity.

Viscosity of materials in mixing or other types of agitating machinery can often be measured indirectly by measuring the power input to the electrical motor which drives the mixer. In many processes



of this type, the materials must be mixed to a given viscosity, or until a definite reaction end point is reached where viscosity undergoes an abrupt change. By experience, viscosity can be related directly to motor input in kilowatts. For such applications, Leeds & Northrup Micromax instruments such as the Leeds & Northrup Micromax, are being used in a number of plants.

To install one, a thermal converter is connected in the power leads to the drive motor, and converter output is wired to a potentiometer-type load recorder. The instrument continuously records motor input in kilowatts or on some arbitrary scale supplied by the user.

When so desired, the Micromax is equipped to operate alarms on signal lights which inform the machine operator when the end point is reached. For some processes, the Micromax can be supplied to provide automatic control, generally by regulating feed of process material. Where several machines are operating in one shop, data from all of them can be recorded on a single multiple-point recording instrument.

Micromax instruments used for this application are thoroughly standard equipment. The thermal converter, although amply fast-responding to show significant variations, smooths out the usual erratic variations in motor load and shows a true average which permits accurate analysis of trends. Because the potentiometer method is used for measurement, distance between thermal converter and the Micromax recorder has no effect on accuracy of measurements.

Drum Melter

Simple scheme at Atlas Powder Co. melts drums of hardened material in a hurry.

Chemical users are often confronted in winter with drummed raw materials hardened to brick-like consistency. Taking an ax to the drum is the impulsive but expensive way of meeting the problem. Dumping the drum in a tank of hot water is another, but bungs often loosen and the product floats to the top or sinks to the bottom of the tank, which means a messy clean-up job.

Atlas solved the problem in its new derivatives plant (*CI, Sept. 1949, p. 350*) by a convenient method that requires neither expensive equipment nor much labor. The equipment, as a matter of fact, can be put together from odds and ends found in any plant shop.

A small room off the receiving area is floored with spaced planking, the concrete floor underneath sloping to a drain. Vertical pipes come down at regular intervals from hot water pipes along the ceiling. Rubber hose is attached at one end to the vertical pipes, and at the other end to an X-shaped manifold made out of standard pipes and fittings. A pallet holding four drums is trucked into the room and set on the floor, a manifold is placed across the tops of the drums so that each of the four outlets discharges on a drum head. The water is turned on and the set-up is left alone until the material has melted. No tank to bother with, no damage to the drums, no mess in case of leakage.

Hg-Vapor Detector Traces Underground Fire

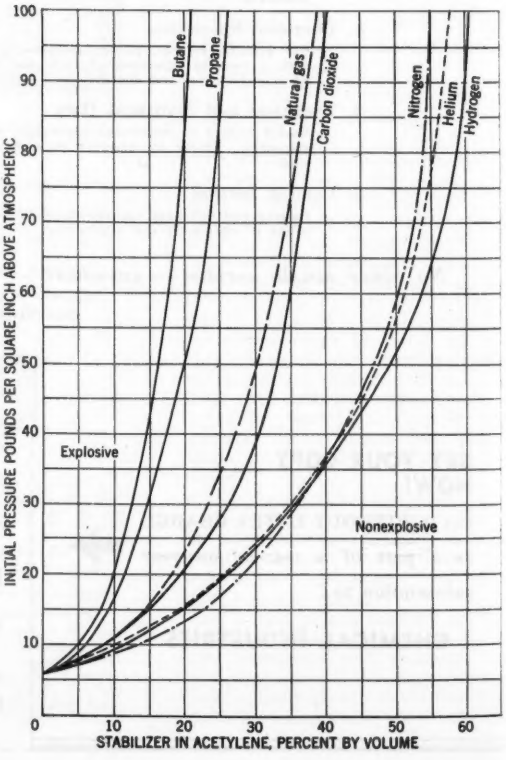
Progress of one of the largest man-made fires in history, burning underground 55 miles northwest of Birmingham, Ala., is being followed by a General Electric electronic mercury-vapor detector. The fire, started intentionally last March, is in the Alabama Power Co.'s Gorgas Mine, where underground gasification experiments are being conducted by the U. S. Bureau of Mines and the Southern Research Institute.

At regular intervals through the vein, small capsules of mercury have been placed in the path of the blaze. The mercury-vapor detector keeps a constant check on the gases pouring from the mine. When the fire, which may create temperatures as high as 3000° F., reaches a capsule, the mercury is vaporized. This is detected by the instrument and provides a check on flame progress.

Acetylene Explosibility

Recent experiments by the Bureau of Mines have shown that the maximum permissible pressure for portable acetylene generators, 15 psig, is too high to prevent explosions of gaseous acetylene in the absence of air. However, it was found that the addition of hydrocarbons render the acetylene less explosive, their effectiveness increasing with increasing molecular weight. For example, the percentage of hydrocarbon required to prevent explosion at 15 psig is: Natural gas, 13.8%; propane, 9.2%; butane, 8.4% by volume.

The experimental results for the determination of the inhibiting effects at pressures up to 100 psig are shown in the accompanying graph. Data for carbon dioxide, nitrogen, helium, and hydrogen are also shown.



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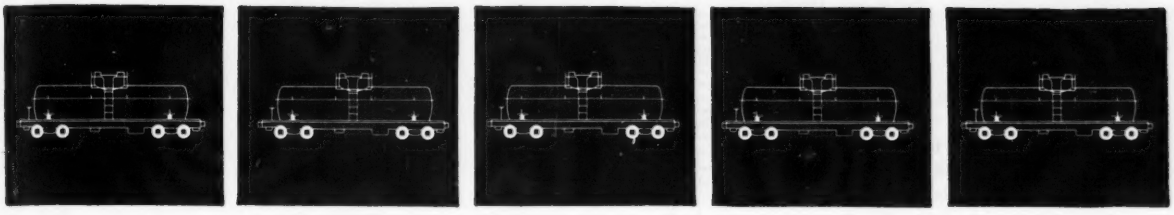

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Readers are invited to submit for publication in this department any original nomographs pertaining to chemistry or engineering. $10 will be paid for each one used.

Allowable Stress in Compression Members

by JOSEPH I. LACEY

Hooker Electrochemical Co.
Niagara Falls, N. Y.

THE American Institute of Steel Construction has prescribed formulas for the allowable working stress in steel compression members. When the ratio (l/r) is less than 120, the unit stress is defined by[2]:

$$f = 17{,}000 - 0.485\left(\frac{l}{r}\right)^2 \qquad (1)$$

All major members must have an l/r ratio less than 120. The l/r ratio of secondary members may be as high as 200. In the l/r range of 120 to 200, the unit stress is given by[2]:

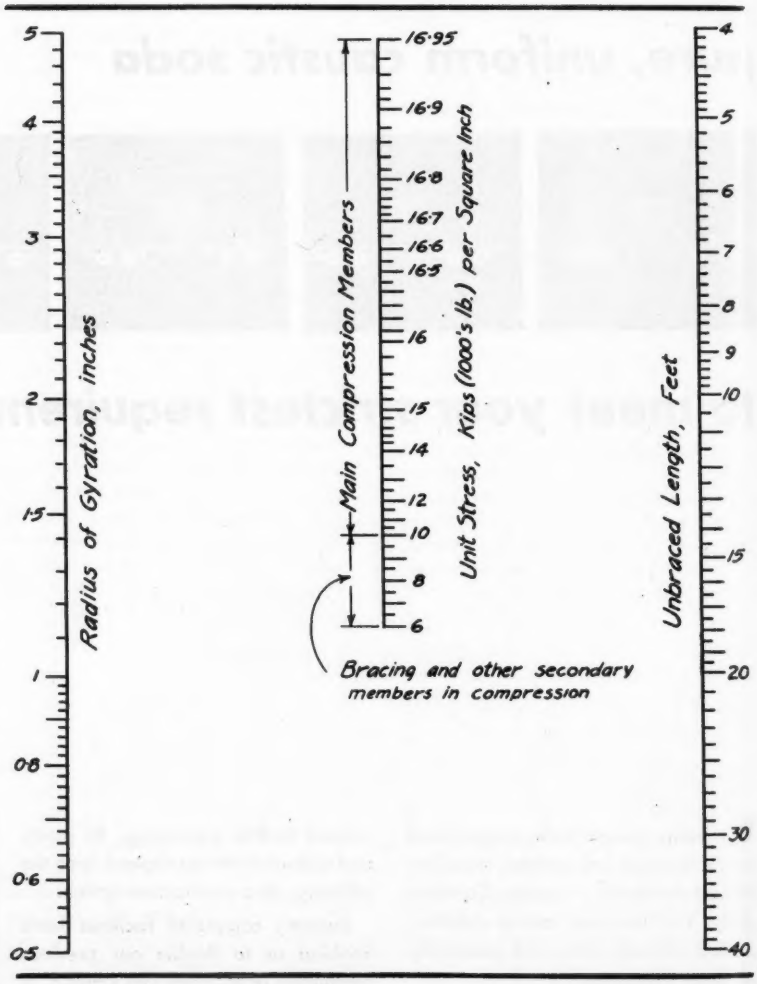
$$f = \frac{18{,}000}{1 + \frac{(l/r)^2}{18{,}000}} \qquad (2)$$

Equations 1 and 2 may be represented by a single three-variable logarithmic nomograph[1] by reducing them to

$$l/r = F(f) \qquad (3)$$

where F(f) is a function of f alone. On the chart the boundary between main and secondary members, corresponding to l/r = 120, has been indicated.

The use of the nomograph is illustrated as follows: It is desired to use a 12-inch x 64-pound wide flange beam as a main column; it is to have an unbraced length of 20.0 feet. Steel handbooks show this section to have a least radius of gyration of 2.51 inches. Draw a straight line from 2.51 on the radius of gyration scale to 20 on the length scale. At its intersection with the unit stress scale read 12.6 kips (M pounds) per square inch (12,600 lb./sq. in.) as an allowable working stress for the member. It is within the range of main compression members and satisfies the l/r condition for main columns.


Radius of Gyration, inches
Main Compression Members
Unit Stress, Kips (1000's lb.) per Square Inch
Unbraced Length, Feet
Bracing and other secondary members in compression

Literature Cited

(1) Davis, D. S., 'Empirical Equations and Nomography', p. 104, New York, McGraw-Hill Book Co., 1943.
(2) American Institute of Steel Construction, 'Specifications for the Design, Fabrication and Erection of Structural Steel Buildings', Section 10A.

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LABORATORY NOTEBOOK

H-F Voltage Standard

National Bureau of Standards is developing primary standards of voltage for radio frequencies up to several hundred megacycles.

A practical high-frequency voltage standard must combine reliability with maximum precision and should approach the accuracy of the direct-current voltage standard, the standard cell. On this basis the Bureau has concentrated on methods of measuring single frequency voltages directly in terms of a standard DC cell. Techniques have been chosen for best time-efficiency and accuracy over the widest range of voltage and frequency, without using frequency corrections. Reliability has been achieved by cross-checking the results of several independent methods based on different principles. Reproducibility of results and agreement between individual primary standards is required within ±1%, an accuracy of good precision in the h-f range.

One method which meets the basic requirements for a primary standard is the voltage-measuring bolometer bridge. This utilizes the dependence of bolometer resistance on power dissipation. A DC bridge with a bolometer in one of its legs is first balanced on DC. R-f power is then substituted for some of the DC power and the bridge is rebalanced. The amount of r-f power equals the difference in DC power required to provide a balance in each case.

Several major developments permit use of the bolometer bridge for h-f voltage measurements. Microscopically small thermistors (0.015" dia.) form a type of bolometer remarkably suited for the job. A special mount for a two-thermistor arrangement eliminated frequency corrections and reduced the temperature-time lag of the thermistors with consequent reduction in time required to obtain a bridge balance. Special switching, shorting and interlocking circuits were developed for instantaneous replacement of r-f power by DC. Close and frequent checking of bridge balance with and without r-f are provided for, largely eliminating interference from incidental drifts of ambient temperature and DC voltage sources. Further, this circuit allows maximum precision in measurement of small increments of large DC voltage values.

The thermistor bridge has been used so far from 20 millivolts to 1.5 volts at all frequencies from audio to 800 megacycles. The top frequency limit may be considerably higher, but this limit will not be established until other independent methods are available at the higher frequencies.

Individual factors limiting voltage accuracy have been analyzed and correlated with voltage range. These include effective thermistor sensitivity, bridge sensitivity, stability of the DC voltage supply, irreducible voltage drops in the circuit, thermal voltages, and ambient temperature variations, as well as limitations in measuring DC voltages and the resistance of bridge elements.

The low voltage limit measurable with a total accumulated error of 1% has been evaluated by assuming a possible 0.1% contribution from individual factors; the computed low voltage limit agrees closely with the experimental value. Mounting a large number of thermistors in a series-parallel circuit promises to reduce this low limit still further. Conecting the thermistors in parallel for r-f and in series for DC balancing produces low over-all r-f resistance and voltage without sacrificing DC precision.

Concentric Tube Distilling Column

Glass Engineering Laboratories, 521 O'Neill Ave., Belmont, Calif., will manufacture a commercial laboratory model of the rotary concentric-tube distilling column developed by Willingham, Sedlak, Westhaver, and Rossini on API Research Project 6 at the National Bureau of Standards (Ind. Eng. Chem. *39*, 706 1947).

The commercial model will have an annular space of 1 mm., with a cylindrical rotor 5" in diameter and 5' in length, operating at either 4000 or 8000 rpm. The original test model has about the same annular space, with a rotor 3" by 2', operating at 4000 rpm.

On the basis of results achieved on the original model it has been calculated that the commercial model will yield 500 equivalent theoretical plates at total reflux with a throughput of one gallon of liquid per hour. The unit will operate at one atmosphere. For 4000 rpm and a throughput of two gallons of liquid per hour, the calculated number of equivalent theoretical plates at total reflux is 135.

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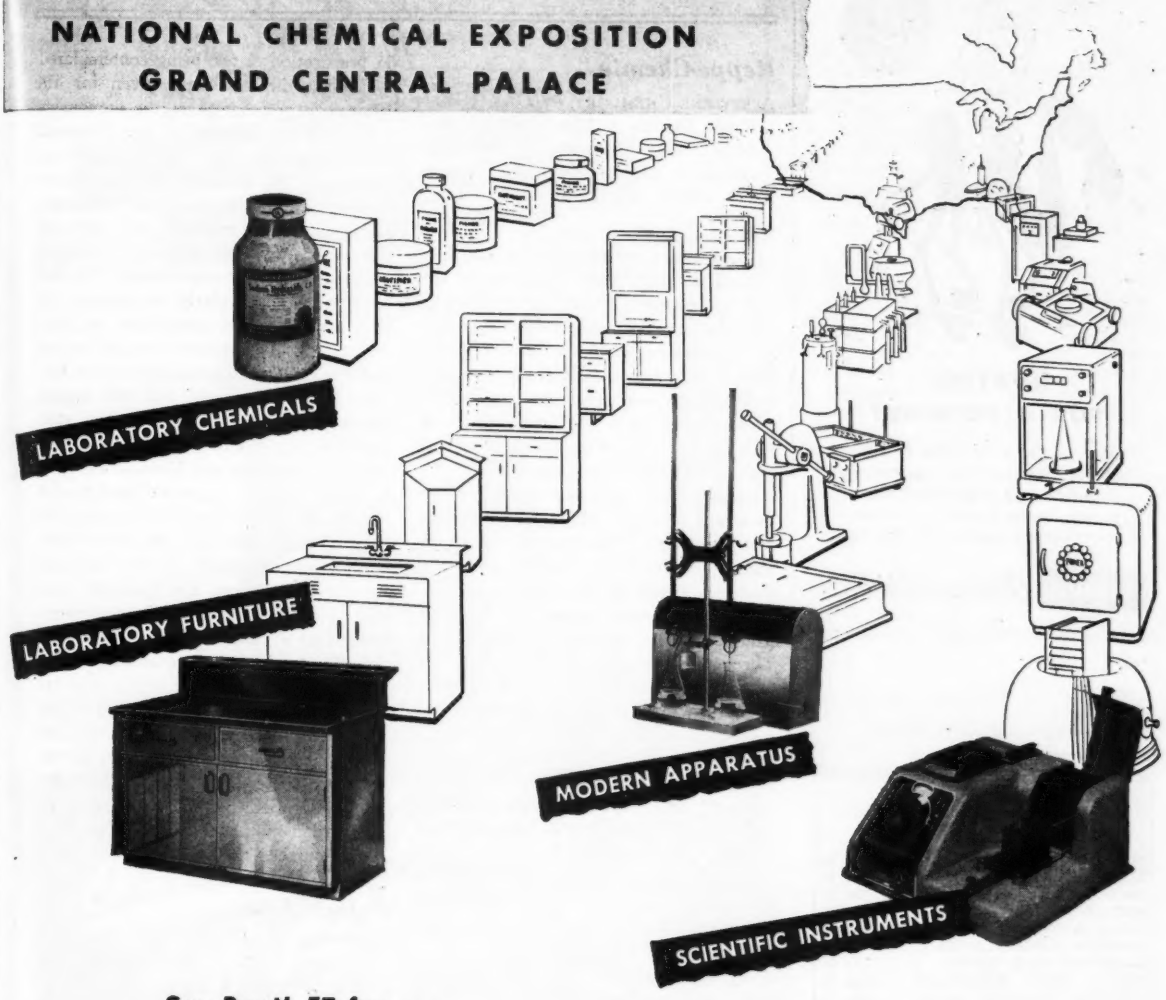

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Reppe-Chemie

ACETYLENE CHEMISTRY, *by Julius Walter Reppe,* Charles A. Meyer and Co., Inc., New York; 1949; 209 pp; $10. Reviewed by Herman W. Zabel, ASSOCIATE EDITOR.

REPPE'S work on acetylene chemistry so unique and different that it has been dubbed Reppe-Chemie. Perusal of this report, however, serves as a reminder that the accomplishments of Reppe and his co-workers were not limited to the field of acetylene chemistry. Instead they include many new syntheses from carbon monoxide, ethylene, and acetaldehyde, as well as those based on acetylene. These are all described with appropriate references to the numerous patents which grew out of this work. It is unfortunate that the patent references to the U. S. Patents, which cover various phases of this work, could not have been more complete. The German patents, on the other hand, seem to be covered thoroughly. Throughout the text the Editors of this work have tantalized the reader by notes similar to the following: Flowsheet for vinylation under pressure (Not available.—Ed.); a more complete reference to U. S. patents would have enabled many of these gaps to be partially filled, since in this example the flowsheet was carried with the patent.

Another failing is that this work is cast in a completely literal translation rather than a common and readable English idiom.

Nobody interested in the farthest reaches of synthetic organic chemistry can afford to be without the information provided here.

Monomers

MONOMERS, *edited by E. R. Blout, W. P. Hohenstein, and H. Mark.* Interscience Publishers, Inc., New York, 1949; loose-leaf collection of offset-printed booklets in post binding, 337 pp., $7.50. Reviewed by James R. Dudley, American Cyanamid Co.

THE PURPOSE of this collection is to present to those interested in the preparation of polymers a series of comprehensive articles devoted to commercially available monomers.

The subjects of this volume are acrylonitrile, butadiene, isobutylene, isoprene, methyl methacrylate, styrene, vinyl acetate, and vinyl chloride. Articles devoted to other monomers likely to attain industrial importance, such as other methacrylates, acrylic acid, and acrylates, are in preparation or are being contemplated.

Explicit directions are given for the laboratory preparation of the monomers. The sections devoted to the industrial preparation are less detailed, perhaps necessarily so, since the primary source of information is in the patent literature. However, these methods are generally recorded without an adequate evaluation of their industrial importance. The features which particularly recommend the book are the critical compilation of physical data, the procedures for purification and analysis, the information on the hazards of the materials, and the recommendations for their handling and storage. The reviews of the more important chemical reactions are likewise of value to those seeking a general background.

A resume of the conditions required for polymerization and for copolymerization with other monomers is given in each case. These sections are generally brief and incomplete, and they are not recommended as a primary source of information for undertaking investigations on polymerization.

The general nature of the book is such that it has more probable value for academic purposes than for industrial use. However, it could serve in the latter case as a useful adjunct for supplying information not readily available from other sources.

Patent Law

HANDBOOK OF PATENTS, *by Harry A. Toulmin, Jr.* D. Van Nostrand Co., New York and Toronto, 1949; 800 pp., $9.00. Reviewed by Albert S. Davis, Jr., resident attorney, Research Corp.

THIS WORTHWHILE analysis of patent law and "patent considerations" is intended for the professionally-trained client rather than the lawyer or solicitor. It serves its purpose well. One of the great difficulties in translating inventions into patents, and exploiting them once they have been obtained, is that the layman is discouraged or irritated to the point of disregard by the enormous technicality and complexity of patent procedure, which seem so simple to his lawyer.

The major portion of Dr. Toulmin's book is therefore devoted both to explaining what the law is, tersely, and why it behaves as it does. The layman is not merely told, for instance, that the solution of a problem may be patentable even though extremely simple; the author reasons out for him that the true (and patentable) importance of an in-

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CANDY MANUFACTURERS USING CERTIFIED FOOD COLORS will find that glycerine is not only an excellent solvent and suspending agent for FD&C colors but also an effective preservative as well. Where a color solution is to be kept for any length of time, it is advisable to add 25% of glycerine by volume or 32 ounces per gallon of water. (F-19)

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I should like to know the source of those items appearing in Technical Glycerine News which I have checked below.

☐ F-17 ☐ F-18 ☐ F-19

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3 important developments in the chemical field

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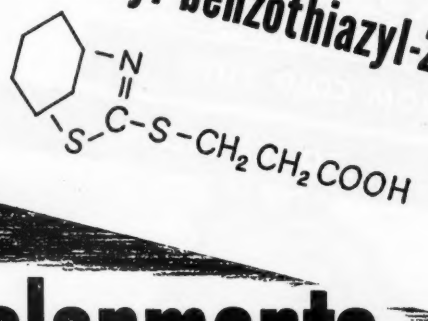

β-Isothioureidopropionic Acid

$$NH_2-C(=NH)-S-CH_2CH_2COOH$$

β-Dithiocarbamylpropionic Acid

$$NH_2-C(=S)-S-CH_2CH_2COOH$$

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vention may be that very simplicity, and illustrates how progress in an art comes about by substituting simple devices for complicated ones.

Dr. Toulmin has fitted into this explanation of the law a sound exposition of how it works in actual application: with patent records, for example; in the stimulation of invention by employees; in thinking about income tax; and in weighing and dealing with infringement situations. The chemical engineer or chemist will find that thorough reading will reward him by better understanding, especially if he is in an administrative or managerial position. The lawyer (unless his need is basic information, quickly) will go on turning to Deller's Walker on *Patents* and to Ridsdale Ellis' *Patent Assignments and Licenses,* and the layman who wants his information in completely non-legal terms is apt to keep using Berle and de Camp's *Inventions and Their Management.* Dr. Toulmin's book is an excellent and useful adjustment between the two extremes.

The index, taken with the chapter and section headings, is entirely adequate. The obsolescence of the photo-offset official Rules of Practice and forms in the appendices can be cured painlessly by purchase from the Patent Office of a pamphlet copy of the new Rules.

Introductory Text

AN INTRODUCTION TO CHEMICAL SCIENCE, *by W. H. Hatcher,* John Wiley and Sons, Inc., New York; 1949; 449 pages; $4.00. Reviewed by R. E. Black, professor of chemistry, Morningside College.

IN THIS second edition, Professor Hatcher, of McGill University, has improved the value of his book for an introductory course in chemistry for liberal arts students. These improvements consist of additional material concerning the properties of matter, metals and alloys, plastics, and pharmaceuticals.

This book is a comprehensive survey of chemistry. It is of special value in that it will benefit the students in their later life, with its emphasis on the applications of chemistry in the home and especially on the chemistry of food, nutrition, and digestion. From the pedagogical standpoint the book has the advantage over most books of this type in that it includes both a summary of each chapter and review questions. It is regrettable, however, that the questions have not been more carefully selected from the viewpoint of thinking and reasoning on the part of the student. The omission of atomic energy and radiochemistry detracts from the value of this new edition. The scarcity of arithmetical problems and numerical data improves the usefulness of this book for students with only a meager foundation in mathe-

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*At 10 cents per copy**

Centrifugals Replace Tables for Separation of Starch and Gluten
by Robert L. Taylor, January, 1948 ☐

Making 1080 Safe
by R. F. Jenkins and H. C. Koehler, February, 1948 ☐

Quaternary Ammonium Germicides
by C. A. Lawrence, January, 1947 ☐

What Makes a Good College Trainee for Chemical Companies?
by Robert N. McMurry, January, 1949 ☐

*At 50 cents per copy**

Agitators for Liquids
by Julian C. Smith, March 1949 ☐

Cellulose
by Merle Heath, March, 1948 ☐

Diaphragm vs Amalgam Cells
by Robert B. MacMullin, July, 1947 ☐

Drying Oils
by George M. Sutheim, January and February, 1948 ☐

Employee Relations Practices in the Chemical Industry
by Robert C. Forney, November, 1948 ☐

Industrial Carbon
by Raymond B. Ladoo and C. A. Stokes, October, 1948 ☐

Phenol
by R. F. Messing and W. V. Keary, July and August, 1948 ☐

Survey of Starch, Protein and Synthetic Resin Adhesives
by Alexander Frieden, October, November, December, 1946 ☐

Synthetic Chemicals for Agriculture
by R. H. Wellman, June and August, 1948 ☐

Synthetic Detergents, Main Types, Uses, Properties and Prospects
by John W. McCutcheon, November, 1947 ☐

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by Ralph K. Lamie, April, 1948 ☐

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matics. The subject of chemistry is presented in Hatcher's book from the standpoint of principles rather than from that of laboratory experimentation and technique. This makes the presentation of lecture demonstrations more desirable than actual laboratory work by the student.

The author is to be complimented on the excellent method of presentation and comparison of the physical properties of the metals. The classification of the section on industrial chemistry according to the raw materials is unique in books of this type. The book could be improved by more careful editing and more judicious choice of vocabulary; such words as *juxtaposition, ionogen, inextricably* and *inspissated* seem inappropriate for an elementary text.

This revised book is well worth the attention of professors interested in a simple comprehensive presentation of the subject of chemistry.

Other Publications

RESEARCH COMMENTS is a new periodical publication published by Evans Research and Development Corp., 250 E. 43d St., N. Y. City. Chemists and research executives will be put on the mailing list upon request.

CHAMBER'S TECHNICAL DICTIONARY, containing over 50,000 technical words and phrases from 130 fields, is described as a convenience to secretaries handling technical correspondence. 976 pp., $6.50, The Macmillan Co., 60 5th Ave., New York 11, N. Y.

DE LAVAL ENGINEERING HANDBOOK, for users of pumps, turbines, compressors and gears, has been thoroughly revised. $2, Advertising Dept., De Laval Steam Turbine Co., Trenton 2, N. J.

SELLING TO U. S. GOVERNMENT is a new weekly-letter and personal-service business aid available for $40/6 mo. or $75/yr. Suite 1057, National Press Bldg., Washington 4, D. C.

SUPERVISORY TRAINING: CASE STUDIES is a report prepared by Metropolitan Life Insurance Co., 1 Madison Ave., New York 10, N. Y., available to executives upon letterhead request.

DIRECTORY OF NEW YORK IMPORTERS, 1949, $5, Commerce and Industry Assn. of N. Y., Inc., 233 Broadway, New York 7, N. Y.

PROCEEDINGS OF THE FIRST ANNUAL NORTHERN CALIFORNIA RESEARCH CONFERENCE, 80 pp. $2, Public Relations Office, Stanford Research Institute, Stanford, Cal.

CONTROLLING FACTORS IN ECONOMIC DEVELOPMENT, by Harold G. Moulton. $4, The Brookings Institution, Washington 6, D. C.

ANTIBIOTICS DERIVED FROM BACILLUS POLYMYXA, 160 pp., $2.25, New York Academy of Sciences, Central Park W. at 79th St., New York 24, N. Y. Also from the Academy, THE ADRENAL CORTEX, 170 pp., $3.

EXTRACTION OF SOYBEAN OIL BY TRICHLOROETHYLENE, Bulletin 165, 89 pp., no charge. Iowa State College Bulletin, Ames, Iowa.

IODINE ABSTRACTS AND REVIEWS, Vol. 1, No. 1, 26 pp. plus author and patent indexes, is dated July 1949. The periodical will be sent free of charge upon application to Iodine Educational Bureau, Inc., 120 Broadway, New York 5, N. Y.

TOXIC EYE HAZARDS, 101 pp., $1, is written with special regard to industrial chemicals. The Natl. Society for the Prevention of Blindness, 1790 Bdway., New York 19, N. Y. Reduction on quantity orders.

FINISHES FOR ALUMINUM, new revised edition, 124 pp., free upon request to Reynolds Metals Co., 2500 S. 3d St., Louisville 1, Ky.

CANADIAN TRADE INDEX, 1949 Edition, 1106 pp. listing over 10,000 Canadian mfrs. alphabetically and by products. $6 (Canadian), Commercial Intelligence Dept., Canadian Mfrs. Assn., Inc., 67 Yonge St., Toronto 1, Ont., Canada.

ALUMINUM STRUCTURAL DESIGN, 124 pp., free upon request to Reynolds Metals Co., 2500 S. 3d St., Louisville 1, Ky.

CONSULTING SERVICES, 132 pp., is a new and enlarged edition of the annual directory setting forth the special fields served by the members of the Assn. of Consulting Chemists and Chemical Engineers, Inc., 50 E. 41st St., New York 17, N. Y. Free on request.

GLYCERINE AND GLYCERINE DERIVATIVES is a translation of various sections of Beilstein. 210 pp., $2.50, Glycerine Producers' Assn., 295 Madison Ave., New York 17, N. Y.

SYMPOSIUM ON INDUSTRIAL GEAR LUBRICANTS, 24 pp., 75¢, A.S.T.M. Headquarters, 1916 Race St., Phila. 3, Pa.

TUBERCULOSIS IN INDUSTRY, 29 pp., 50¢ Industrial Hygiene Foundation, 4400 5th Ave., Pittsburgh 13, Pa.

TESTING AND RESEARCH IN MODERN INDUSTRY, 113 pp., U. S. Testing Co., Inc., 1415 Park Ave., Hoboken, N J.

CHLOROSULFONIC ACID, Safety Data Sheet SD-33, 20¢ (remittance with order), Manufacturing Chemists' Assn., 246 Woodward Bldg., Washington 5, D. C.

PRECISIONOMICS is a new periodical publication sent upon request to those interested in "developments in scientific research and production control apparatus." Precision Scientific Co., 3737 W. Cortland St., Chicago 47, Ill.

DISPOSAL OF SOUTHERN WAR PLANTS, 74 pp., 50¢, Natl. Planning Assn., 800 21st St., N. W., Washington 6, D. C.

PROCEEDINGS OF THE TECHNICAL SESSION ON BONE CHAR RESEARCH, 321 pp., $2, J. M. Brown, Revere Sugar Refinery, 333 Medford St., Charlestown 29, Mass.

SUGAR, ITS PRODUCTION, TECHNOLOGY, AND USES, by Andrew Van Hook. 151 pp., $3, Ronald Press Co., 15 E. 26th St., N. Y. 10, N. Y.

MODE OF ACTION OF ORGANIC INSECTICIDES, by Robert L. Metcalf. 84 pp., extensive bibliography, $1, Publications Office, Natl. Research Council, 2101 Constitution Ave., Washington 25, D. C.

WHAT ARE NEW CHEMICALS GOOD FOR? is the published proceedings—talks by the chairman and panel members and round-table discussion—of a symposium held at the 115th A.C.S. meeting. R. H. Ewell, Stanford Research Inst., Stanford, Cal., $1.

BASIC MARKETING CHART OF THE UNITED STATES, graphically showing population and economic trends. 17" x 22". $2.50 each, substantial reductions on quantity orders. Research Corp. of America, 341 Madison Ave., N. Y. 17, N. Y.

WHO'S WHO IN PLASTICS, 244 pp., lists almost 3000 individuals and companies. $4.50 to SPI members, $5.50 to nonmembers. Society of The Plastics Industry, Inc., 295 Madison Ave., New York 17, N. Y.

SAFE HANDLING OF COMPRESSED GASES, 15 pp., 25¢. Specify pamphlet or loose-leaf form. Compressed Gas Assn., 11 W. 42nd St., New York 18, N. Y.

CATHODIC PROTECTION of galvanized tanks by use of magnesium alloy anodes, 25¢. Cleveland Heater Co., 2310 Superior Ave., Cleveland 14, O.

WATER POLLUTION ABATEMENT MANUAL for insoluble and undissolved substances, Manual Sheet W-2, 10 pp., 20¢, Manufacturing Chemists' Assn., 246 Woodward Bldg., Washington 5, D. C.

ACIDS, BASES, AND NON-AQUEOUS SYSTEMS, by L. F. Audrieth (23rd annual Priestley lectures), 66 pp., $2, Phi Lambda Upsilon, Dept. of Chem., Penn State College, State College, Pa.

NEW INDUSTRY COMES TO THE SOUTH, 32 pp., $1, Natl. Planning Assn., 800 21st St., Washington 6, D. C.

BIBLIOGRAPHY OF ELECTRO-ORGANIC CHEMISTRY, Part I, by Sherlock Swann, Jr., 114 pp., $1. 358 Admin. Bldg., Univ. of Ill., Urbana, Ill.

JOURNAL OF GENERAL CHEMISTRY (U.S.S.R.) will be available in English translation, annual subscription $95, from Consultants Bureau, 153 W. 33d St., New York 1, N. Y. Other Russian journals are scheduled for similar handling.

Government

INFORMATION FOR AMERICAN BUSINESSMEN ON THE MARSHALL PLAN, free, Office of Information, ECA, Washington 25, D. C.

SOME CHEMICALS FROM SYNTHETIC LIQUID FUELS PROCESSES, free, Bureau of Mines, Publications Distribution Section, Pittsburgh 13, Pa.

ATTEMPTS TO DEFOAM EXISTING OILS BY PROCESSING, 26 pp., free, National Advisory Committee for Aeronautics, Washington 25, D. C.

From the OTS, Dept. of Commerce, Washington 25, D. C. (remittances payable to the Treasurer of the United States): THE ROYAL SOCIETY SCIENTIFIC INFORMATION CONFERENCE: REPORT AND PAPERS SUBMITTED, 723 pp., $6. A LIST OF PERIODICALS AND BULLETINS CONTAINING ABSTRACTS PUBLISHED IN GREAT BRITAIN, 62 pp., 80¢. INSPECTION OF PAINT AND VARNISH ACTIVITY IN EUROPE, 37 pp., $1. J.I.O.A. SUBJECT INDEX: C.I.O.S. VOLUME I, 270 pp. (covering over 1000 reports on European technology), $3.

From the Superintendent of Documents, U. S. G. P. O., Washington 25, D. C.: INSECT AND OTHER ANIMAL PESTS OF CINCHONA AND THEIR CONTROL IN PUERTO RICO, 16 pp., 10¢ REPORT OF THE FEDERAL EXPERIMENT STATION IN PUERTO RICO, 27 pp., 10¢.

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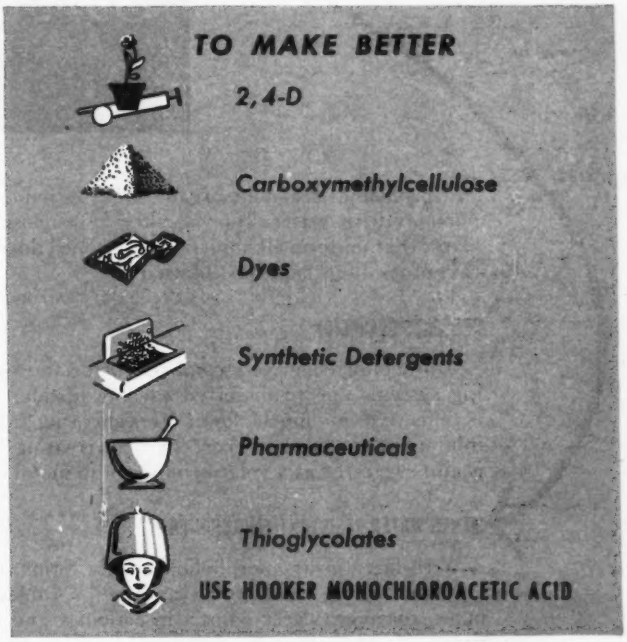

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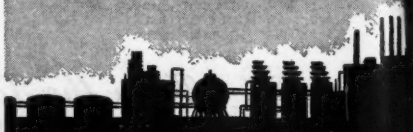

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Technical Bulletin No. 28 explains proper use of Emcol RGL, a plastic edible emulsifier, to provide shortening function in bread, etc. The Emulsol Corp.

Heptafluorobutyric Acid **B810**
16-p. booklet describes physical and chemical properties, applications and handling of heptafluorobutyric acid. Corrosion data, vapor pressure and viscosity-density graphs included. Minnesota Mining and Manufacturing Co.

Polyester Resin **B811**
Bulletin gives physical test data on Genpol polyester resin A-20, data on exothermic heat of reaction, and information on catalysts and catalyst-promoter systems for use with it. General Tire and Rubber Co.

Chloral **B812**
28-p. bulletin gives typical reactions of chloral with hydrocarbons, hydroxyl compounds, carbonyl compounds, acids, amines, other nitrogen compounds, and organo-metallic compounds. Bibliography of some 250 references on use included. Technical Bulletin No. 206, Westvaco Chemical Division, Food Machinery and Chemical Corp.

Chemicals, Prices **B813**
8-p. price list. Gane and Ingram, Inc.

Synthetic Organic Chemicals **B814**
16-p. booklet contains data on applications and physical properties for more than 200 synthetic organic chemicals. Material presented in tabular form. Form 6136, Carbide and Carbon Chemicals Corp.

2-Methyl-1,4-Naphthoquinone **B815**
Booklet summarizing properties, reactions and uses of 2-methyl-1,4-naphthoquinone. Velsicol Corp.

Resins, Synthetic **B816**
Research Bulletin No. 37 lists Research Information Service reports now available on Germany's war-time and postwar advances in the plastics and lacquer industries. 11 pp., Research Information Service.

Chemicals, Organic **B817**
14-p. catalog lists prices of over 200 organic halides. Catalog No. 7, Halogen Chemicals, Inc.

Coating Emulsions **B818**
Data on properties, characteristics and applications of 3 acrylic coating emulsions of the Rhoplex family. 20 pp., Resinous Products Division, Rohm and Haas Co.

Pulp Bleaching **B819**
Booklet describes pulp bleaching with hydrogen peroxide. Buffalo Electro-Chemical Co.

Food Industry **B820**
20-p. booklet describes contributions of chemistry to the production, processing, packaging and merchandising of food. Monsanto Chemical Co.

Chemicals **B821**
Price list of chemicals available from Fritzsche Brothers, Inc. 12 pp.

Rubber Developments **B822**
24-p. bulletin discusses current rubber developments, including an article on manufacture of rubber hydrochloride and one on electrically conductive rubber. Volume 2, No. 3, British Rubber Development Bureau.

Fine Chemicals **B823**
6-p. folder lists prices of chemicals available from Schwarz Laboratories.

Chrome **B824**
4-p. bulletin describes Q-chrome neutral base refractory cement. Bulletin No. 322 F, Quigley Co., Inc.

Silicates **B825**
15-p. booklet on the properties and uses of soluble silicates. Analyses covering chemical characteristics, physical properties, alkali-silica ration, degrees Baumé and basic advantages given for 19 of the more popular silicates. Philadelphia Quartz Co.

Catechol **B826**
28-p. bulletin describes uses, chemistry and properties of catechol. Covers both technical and commercial information. Bulletin C-9-127, Chemical Division, Koppers Co., Inc.

Detergents, Synthetic **B827**
Folder explains uses of synthetic detergents and describes three general types, anionic, cationic, and non-ionic and advantages of each type. Antara Products, General Aniline and Film Corp.

Dialkyl Cyanamides **B828**
16-p. booklet describes chemical and physical properties of dialkyl cyanamide and several of its homologues. Suggested applications included. American Cyanamid Co.

Fuel Oil Additive **B829**
6-p. folder describes physical composition of Houghto-Solv, fuel oil additive which dissolves sludge in oil storage tanks and system, and how it functions during operation. E. F. Houghton and Co.

Plasticizers **B830**
12-p. booklet gives specifications, properties and uses of all plasticizers manufactured by Tennessee Eastman Corp.

Drugs and Vitamins **B831**
Bulletin No. 38 lists translations of research records, manufacturing processes and patent applications from the files of German manufacturers. Research Information Service.

Primers **B832**
Folder describes Zapon primers and primer surfaces. Properties of the various materials are listed in chart form with recommendations for particular types of surfaces and end uses. Industrial Finishes Dept., Atlas Powder Co.

Cleaners **B833**
5 bulletins describe features and give directions for cleaners for steel, zinc, aluminum, and brass. Enthone, Inc.

Hydrocarbons **B834**
Price list for research grade, pure grade, technical grade and commercial grade hydrocarbons, and aliphatic sulfur chemicals. Phillips Petroleum Co.

Black **B835**
4-p. bulletin describes physical properties and formulations of Aromex black, a highly reinforcing fine particle size black. J. M. Huber Corp.

Paste Type Alloys **B836**
2-p. bulletin describes materials for brazing, silver soldering, and soft (low temperature) soldering. Information on application and use included. Fusion Engineering.

Emulsions and Detergents **B837**
72-p. booklet describes properties, formulations, and preparations for emulsifying agents, soluble oils, solvent and industrial wax emulsions and detergents. Carbide and Carbon Chemicals Corp.

Dihydrazine Sulphate **B838**
7-p. bulletin describes properties and use of dihydrazine sulphate (technical). Technical sales Bulletin No. 124.1, Mathieson Chemical Corp.

Adhesive **B839**
4-p. folder describes features and applications of synthetic rubber-resin solvent cement. The Flintkote Co.

Equipment

Laboratory Short Cuts **J632**
16-p. booklet describes 20 laboratory short cuts. Subjects include Delivering Liquids at Constant Rate, A Convenient Continuous Extractor, A Siphon Starter and Closed System Filtration for Analytical Work. Previously published in the CHEMIST ANALYST. J. T. Baker Chemical Co.

Joints J633
2 booklets describe dimensions and design of high temperature rotating joints and high temperature swivel joints. 4 pp. each, Chicksan Co.

Switches J634
Catalog No. 1343 describes types of mercury switches for electrical switching. Engineering data and selection tables presented. 16 pp., Minneapolis-Honeywell Regulator Co., Brown Instrument Division.

Materials Handling J635*
4 bulletins describe advantages and specifications of light medium duty belt conveyor, flex-grid belt conveyor, portable cleated belt booster, and double-flex chain and case conveyor. Bulletins Nos. PB64-70-3A, HP-6, F-27-1A, and PC18-1A-2. Island Equipment Co.

Drainage Control J636
24-p. booklet discusses high pressure, high temperature condensate return, and specifications for 2 types of units. Flow diagrams and details of installation included. Publication No. 3250. Cochrane Corp.

Gauges and Valves J637
2 bulletins, one describing the Truscale gauge for boiler and other water levels, the other describing gauge and valve accessories. Jerguson Gage & Valve Co.

Flame Failure Safeguard J638
Bulletins Nos. CG 4751 and CH 4753 describe flame failure safeguards for combination gas-oil burners. Combustion Control Corp.

Franklin Institute J639
38-p. booklet describes expanded facilities of research and development laboratories at The Franklin Institute.

Fire Protection J640*
12-p. booklet outlines procedures to reduce hazard of fire. 7 departmental charts for checking flammable hazards included. The Protectoseal Co.

Ball and Roller Bearings J641
112-p. catalog and engineering data booklet describes the Link-Belt Co.'s complete line of ball and roller bearings. Includes data on construction features, prices, weight, load ratings and dimensions. Book No. 2550.

Rectifiers J642
Booklet No. DB-19-025 describes standard and high voltage selenium rectifiers for power supplies and electronic circuits. Efficiency curves included. Westinghouse Electric Corp.

Plexiglas J643
"Plexiglas for Product Demonstration" describes how transparent acrylic can be used to build working and exhibit models. Tabular data on properties and various forms of the plastic included. Plastics Dept., Rohm & Haas Co.

Bell Jars J644
1-p. bulletin gives dimensions and prices of lucite bell jars for use in testing laboratories. The Emil Greiner Co.

Water Conditioning J645
20-p. booklet describes design and application of water conditioning equipment, zeolite water softeners, and water treating chemicals. Bulletin No. 610. Elgin Softener Corp.

Screw Capping Machine J646
2-p. bulletin describes advantages of automatic screw capping machine. Tite-Cap Machine Co.

Respirator J647
Bulletin No. CR-23 describes features and uses of gas-fume respirator for protection against mists, dusts, fumes, organic vapors and acid gases. 2 pp., Mine Safety Appliances Co.

Bearings, Pre-Lubricated J648
Booklet No. B-4378 discusses advantages of pre-lubricated bearings. Tests and case histories included. Westinghouse Electric Corp.

Shelving J649
24-p. catalog gives descriptions and dimensions of steel shelving. Diagrams included. Equipto Division, Aurora Equipment Co.

Flow Instruments and Control Valves J650
24-p. catalog describes advantages and specifications, and diagrams primary and secondary flow instruments and control valves. Catalog No. 50, Fischer and Porter Co.

Blow Torch, Pocket Size J651
1-p. bulletin gives advantages and prices of alcohol blow torch for laboratory use. The Emil Greiner Co.

Mills J652
40-p. bulletin (No. 173) covers rubber and plastics mills, including table of sizes, capacities, power requirements, dimensions, specifications and parts list. Farrel-Birmingham Co.

Piping, Corrosion Service J653
32-p. bulletin contains information on economics, standards, advantages of welding, design tips, technical data and dimensions of stainless fittings and flanges. Bulletin 485, Taylor Forge and Pipe Works.

Float Valves and Boxes J654
4-p. bulletin describes features, dimensions and prices of float valves and float boxes with control valve. O. C. Keckley Co.

Processing Equipment J655
Catalog No. CEC-49 describes and diagrams grinding, mixing, classifying, heat exchange, hydrogenating, gas absorbing and other equipment. Specifications included. 36 pp., Patterson Foundry and Machine Co.

Joints J656
20-p. bulletin describes, diagrams and gives dimension tables for expansion joints. Catalog No. 50, Magnilastic Div., Cook Electric Co.

Elevator and Dumper J657
8-p. booklet describes Cesco dumper for lifting, upending and dumping bags, boxes, barrels and drums. Shows varieties and sizes available. Colson Equipment & Supply Co.

Waste Treatment J658*
"Modern Processes and Equipment for Sewage and Industrial Waste Disposal" includes information on activated sludge, bio-activation, jet aeration, screening, sedimentation, etc. Also contains flow sheets and diagrams. Manual No. 149, 24 pp., American Well Works.

Chemical Plant Construction J659
4-p. bulletin describes facilities of Nicolay Titlestad Corp. for design and construction of heavy chemical plants.

Telemeters J660
20-p. bulletin, No. GEA-5233 describes telemetering equipment for electric power distribution and industrial applications. Includes information on frequency, torque-balance and photoelectric type telemeters and wiring diagrams. General Electric Co.

Cylinders, Glass J661
6-p. folder describes dimensions, finishes and prices per piece of glass cylinders. Dunbar Glass Corp.

Agitators J662
28-p. catalog describes "Pneumix" air-motored explosion proof agitators for laboratory and production use. Applications included. Pneumix Division, Eclipse Air Brush Co.

Heating Units, Electric J663
Catalog describes 4 basic Chromalox units, strips, rings, tubulars, and cartridges, with data on wattages, voltage and sheath material, and application. Catalog 50, Edwin L. Wiegand Co.

Bar Screen J664
4-p. folder describes advantages and diagrams bar screen for removal of trash and large solids from water and sewage. Folder No. 2327, Link-Belt Co.

Starter J665
4-p. bulletin describes installation, design and dimensions of oil-immersed, wall-mounted starter for control of squirrel cage motors. Diagrams included. Bulletin No. 14B7274, Allis-Chalmers Mfg. Co.

Laboratory Instruments J666
4-p. bulletin describes features and dimensions of various laboratory instruments, including gas analyzers and thermometers. The Emil Greiner Co.

Pumps, Industrial J667
Bulletin 725.3 gives complete details including specifications, dimensions and performance curves on stainless steel industrial pumps. 8 pp., Goulds Pumps, Inc.

Turntables J668
4-p. bulletin describes standard sizes, weights and features of pressed steel turntables. Bulletin No. 48, Hardinge Co., Inc.

Compression Distillation J669
4-p. bulletin describes principles of compression distillation and its present applications. Diagram included. Arthur D. Little, Inc.

Hose Couplings J670
Bulletin No. 5 describes complete line of LE-HI suction and water hose couplings. Sizes and weights included. Write Hose Accessories Co.

Valve J671
2-p. bulletin describes specifications and advantages of high silicon iron lubricated plug valves. Diagram included. Bulletin No. 640, The Duriron Co.

Condensers J672
Bulletin 5-A describes sizes, capacities and overall dimensions as well as properties of saturated steam of low-level, multi-jet condensers. Schutte and Koerting Co.

Liquid Handling Equipment J673
16-p. bulletin gives information on liquid handling equipment, including filters, filter sheets, pumps, mixers and cappers. Ertel Engineering Corp.

Wire Screen Cloth J674
16-p. booklet includes tables on sizes of openings available for a given diameter of wire and recommendations for wire-diameter to select for a specific type of service. Enamel-coated screen cloth is described. Bulletin 113-A, Robins Conveyors Division, Hewitt-Robins Inc.

Deaerators J675
35-p. describes deaerating equipment manufactured by Cochrane Corp. Includes study of deaeration principle, diagrams, and technical data. Publication 3005.

Motor Generator Sets J676
Form 549-MG diagrams and describes advantages of motor generator sets for testing of electrical devices requiring special frequencies and for laboratory use. 4 pp., Kato Engineering Co.

Speed Reducer J677
8-p. booklet describes features of several Speedaire fan-cooled worm gear reducers. The Cleveland Worm and Gear Co.

Gear Drives J678
16-p. manual contains ratio information, horsepower rating tables, selection procedure, capacities, dimensions and weights, and diagrams of enclosed helical gear drives. Engineering Manual MPA, Foote Bros. Gear and Machine Corp.

Vinyl upholstery coverings are among the hundreds of fast-selling products in the manufacture of which Barrett "ELASTEX" 28-P Plasticizer is used to advantage.

announcing

BARRETT "ELASTEX"

28-P Plasticizer (Dioctyl Phthalate)

Newest Addition to the Barrett Line of Plasticizers

Dioctyl Phthalate is the most widely used plasticizer for vinyl resins. Its very low volatility, good low temperature characteristics, and excellent heat and light stability have recommended its use wherever rigid service conditions must be met.

▶ **OTHER BARRETT* CHEMICALS AVAILABLE TO THE PLASTICS INDUSTRY:**

Dibutyl Phthalate • "ELASTEX" DCHP Plasticizer • "ELASTEX" 10-P Plasticizer • "ELASTEX" 50-B Plasticizer • Phthalic Anhydride • Phenol • Cresols • Cresylic Acids • Toluol

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.
In Canada: The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, Que.

Barrett *

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Barrett *

*Reg. U. S. Pat. Off.

On every drum for every product Penn-Drake specifies:

EQUIPPED WITH TRI-SURE CLOSURES

MORE than 1,000 Penn-Drake products are shipped all over the world. And they are shipped in perfect security from seepage, leakage and tampering—because every Penn-Drake drum is protected by Tri-Sure Closures*

Years ago, the Pennsylvania Refining Company determined to give its products—and the reputation behind them—the finest protection obtainable. So in 1932, when the Tri-Sure Closure was first produced, the makers of Penn-Drake standardized on Tri-Sure protection—for every drum of every product—and they have been using Tri-Sure Closures ever since.

Leaders in the petroleum industry like the Pennsylvania Refining Company have *proved*—with years of experience—that there is no protection like Tri-Sure protection for fine liquid products. And the reason is that Tri-Sure Closures have a *flange* that is integral with the drumstock—as strong as the drum itself; a *plug* which is screwed securely into the *flange;* and a leak-proof *seal*—made of 195 lb. plate—which cannot be removed unless it is deliberately destroyed.

When you order drums, order *safe deliveries*—by specifying "Tri-Sure Closures", the surest safeguard for *your* product and your prestige.

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CLOSURES

*The "Tri-Sure" Trademark is a mark of reliability backed by 27 years serving industry. It tells your customers that genuine Tri-Sure flanges (inserted with genuine Tri-Sure dies), plugs and seals have been used.

Play Safe by Specifying Tri-Sure Closures on Drum Orders

A FEW OF THE MORE THAN 1000 PENN-DRAKE PRODUCTS

Premium Penn-Drake
100% Pure Pennsylvania Motor Oils
Pennsylvania Bright Stocks and Neutrals
Penn-Drake Lubricants and Greases
Industrial Oils (Soluble and Quenching)
Colonel Drake Heavy Duty Oil
Colonel Drake Diesel Oils
Solvents
Insecticide Bases
Hydraulic Oils
Penn-Drake Gumout
Penn-Drake Snow Plow Wax
Drakeol U.S.P. White Mineral Oils
Petrolatums
Petrosuls (Petroleum Sulphonates)
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TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA

NEWS OF THE MONTH

New Construction

Bakelite Corp.'s new phenol plant (*CI, May 1949, p. 744*) near Marietta, Ohio, is now under way. F. H. McGraw & Co., New York engineers and constructors, have signed a contract for work on excavations, foundations and underground piping. Early 1950 is the completion date.

Ground has been broken for Du Pont's new $1.6 million Photo Products research laboratory at Parlin, N. J. It's to be a two-story, soundproof and windowless building with complete facilities for experimental work, including a theater and sound recording studio. It's expected to be finished by next summer.

Tacoma, Wash., is the site of a $5 million vegetable oil processing plant to be built by Tacoma Vegetable Oils, Inc. The company will import and process 36,000 tons of Philippine copra annually, with cocoanut oil and meal as products.

Cargill, Inc. will have one of the largest soybean solvent extraction processings plants in the country when its new Chicago plant is completed next year. Chemical Plants Division of Blaw-Knox Construction Co. is handling the construction job. It's a "turnkey" contract.

Work has begun on an ammonium sulphate unit at Searsport, Me. for Northern Chemical Industries, Inc., subsidary of Summers Fertilizer Co., Inc., Baltimore. Graver Construction Co., New York, is the general contractor. The Kuhlmann (a leading European chemical concern) Process will be used. American Industrial Development Corp., New York, is Kuhlmann's representative for this and other processes.

Production has just begun at American Polymer Corp.'s new plant near Springfield, Ill. Equipment includes facilities for polymerizing vinyl, acrylic, methacrylic, styrene, acrylonitrile, allyl and similar polymers.

Boulder, Colo.'s Arapahoe Chemicals, Inc. is still growing. An additional building has just been completed to provide office and warehouse space and free more space for processing in the main manufacturing area. A plant fire in July had slowed down production, but full-scale operations have been resumed.

E. H. Sargent & Co., Chicago manufacturer and distributor of laboratory apparatus and chemicals, has just completed a new building for its Chicago offices and plant. It's a one-story structure.

Gulf Oil Corp. has opened its new prospecting and geophysical research laboratory in Harmarville, near Pittsburgh, Pa. The two-story structure is the largest of more than forty buildings on the 57-acre research center of Gulf Research & Development Co., Gulf Oil subsidiary, at that location. It's named after Frank Adair Leovy, pioneer advocate of scientific oil exploration.

The world's largest "cat" cracker was put on view at Esso Standard Oil Co.'s Bayway refinery in Linden, N. J. last month. It marked the completion of a two-year $1.5 billion-expansion program by Standard Oil Co. (N. J.) affiliates. The new cracker will process 41,000 barrels of crude oil daily to produce almost one million gallons of gasoline and 250,000 gallons of heating oil daily. Holding capacity of the unit is 900-1000 tons. Catalyst will circulate through it at the rate of 56 tons per minute.

A 49,000 barrel-per-stream-day vacuum pipe still, also the largest in the world, is another major part of the Bayway expansion.

Washington

The Atomic Energy Commission has signed a contract with Chemical Plants Division of Blaw-Knox Co. for architect-engineer services for the engineering design of a new materials testing reactor (*CI, Oct., 1949, p. 643*). Regarded as one of the keys to the AEC's reactor development program, the project will cost about $20 million.

The Economic Cooperation Administration is working on a program to provide small business firms with opportunities to share in Marshall Plan business. When completed, it will provide such firms with a counseling service in exporting under the plan, information of potential purchases to be made in the U. S., names and addresses of European importers and products they have purchased under the Marshall Plan, information on commodities offering greatest opportunities for sales in Western Europe, and a directory of potential American exporters to be distributed to European importers.

Areas suitable for synthetic liquid fuel plants abound in portions of four states (Kentucky, Colorado, Texas, and Montana) recently surveyed by Army engineers. Bureau of Mines Director James Boyd interprets these surveys as indicating that ample raw materials and water for plants of large capacity exist even in semi-arid areas of the West. He reports that abundant coal reserves are available without resorting to coking quality coals. Copies of the reports, "Summary Report to the United States Bureau of Mines on Areas Suitable for Synthetic Liquid Fuels Plants in Western Kentucky, Northwestern Colorado, and Southeastern Texas" and "Summary of Report to the United States Bureau of Mines on Areas Suitable for Synthetic Liquid Fuel Plants in Southeastern Montana," can be had from the Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa.

Stanley C. Hope (left), formerly executive vice-president and director of Esso Standard Oil Co., who was elected president of the company, and Fred H. Haggerson, president of Union Carbide and Carbon Corp., who received the 1949 Medal for the Advancement of Research at the annual banquet of the American Society for Metals.

More on water pollution: The newly organized Water Pollution Control Advisory Board recommended to the Surgeon General that the initial appropriation of $200,000 for planning sewage treatment works be concentrated in "one or a few" river basins. It also recommended that a firm policy be pursued to insure abatement of pollution of interstate waters, pointed out the need for a uniform State law which could be adopted in part or in whole by States interested in strengthening water pollution activities.

General

Chemical companies report the following profits from operations:

Company	*Net Income After Taxes First Nine Months* 1949	1948
Hercules Powder Co.	$7,373,722	$8,328,985
Mathieson Chemical Corp.	5,190,700	3,266,662

	Three Months Ending September 30 1949	1948
International Minerals & Chem. Corp.	$ 805,627	$ 786,091
McKesson & Robbins, Inc.	1,791,501	1,987,213

Industrial building costs are still dropping. The industrial building costs index of the Austin Co., engineers and builders, dropped five points during the third quarter to 161 (1926-100). This is 7½ per cent below the October 1948 peak and compares with April to September 1947 levels. Reasons: improvements equipment; construction labor is giving in availability of building materials and a better day's work.

New processing equipment will share the spotlight with a wide range of new chemical substances available in commercial quantities at the 22nd Exposition of Chemical Industries in Grand Central Palace, New York, November 28 to December 3.

Three technical symposia and two panel discussions will feature the technical program at the 1949 annual meeting of the American Institute of Chemical Engineers, Pittsburgh, December 4-7. Industrial waste disposal, atomic energy, and vapor-liquid equilibria will be the subjects of the symposia; professional licensing and corporation training of young engineers, features of the discussions.

The United States will not need synthetic liquid fuels from coal and oil shale before 1961, even in case of war. That was the prediction of A. L. Solliday, Stanolind Oil and Gas Co.'s executive vice-president, speaking to petroleum men at the American Institute of Mining and Metallurgical Engineers meeting in San Antonio last month.

New Companies

Kessco Chemicals Corp. has been organized as the sales auxiliary of Kessler Chemical Co., Inc., Philadelphia. It will handle sales and distribution of the parent company's entire line, and will be located at the Philadelphia plant of the parent company.

A new associated company, Affiliated Furnace & Engineering, Inc., has been formed by Chemsteel Construction Co., Inc., Pittsburgh. It will specialize in design construction and maintenance of industrial furnaces. Offices will be maintained with the parent company.

Texas Chemical & Supply Corp. has been established in Houston, Tex. It will distribute heavy chemicals, cleaning compounds, detergents, absorbent materials and industrial and building maintenance supplies throughout Texas. Edward H. Wyckoff, formerly with Diamond Alkali, is vice-president and general manager.

Ownership Changes

Elliott Co., Jeannette, Pa., has acquired the business and assets of the Crocker-Wheeler Division of Joshua Hendy Corp. Crocker-Wheeler is one of the oldest manufacturers of motors and generators in the country.

Kent Mill Co., Inc., Brooklyn, manufacturer of pulverizing mills, has been acquired by The Abbe Engineering Co., New York.

Foreign

Fisher Scientific Co., Ltd., has expanded plant facilities and warehouse stocks to provide 25% additional space at its Montreal plant. The new addition adds 8000 sq. ft.

A 25,000-ton annual capacity industrial protective coatings plant is scheduled for Port Arthur, Ont. By-Product Coke Co. of Canada, Ltd., a wholly-owned subsidiary of Koppers Co., Inc., will build on a site leased from Northern Wood Preservers, Ltd., Port Arthur. Coaltar-based coatings produced at the plant will be used for pipelines transporting natural oil and natural gas from rich Alberta oil fields. It's expected to be in operation within three months.

The Glycerin Corp. of Cuba predicts that within a year it will be turning out 20 million lbs. of fermentation glycerine per year from blackstrap molasses at its proposed plant. This will be 10-15% of the total U. S. production. The Cuba plant will use processes developed from patents owned by Sylvania Industrial Corp., American Viscose Corp. and the Glycerin Corp. of America.

With the opening of the new £22 million chemical plant of Imperial Chemical Industries, Ltd., at Wilton, near Middlesborough, England, Britain moves nearer to saving its economy $10 million annually by manufacturing in Britain from Middle East oil, chemicals formerly imported from dollar sources. The first two units—for phenol formaldehyde molding powders and methyl methacrylate sheeting—are in operation, much construction on the proposed oil cracking plant is complete, and a start has been made on a new plant for non-ionic synthetic detergents and polythene.

In addition to petrochemicals, another

ISCO OPERATION NEWS

NOVEMBER, 1949

Isco Caustic Potash

Produced in the ISCO Plant at Niagara Falls, N. Y.

REGULAR GRADES

For all purposes

FLAKE • SOLID • CRUSHED

BROKEN 90%

Also LIQUID 45-50%

For Soap Makers

SPECIAL QUALITY

Liquid FC 45%

Low in chloride and iron-free

Where extra purity is required

ISCO American Selected WALNUT CAUSTIC POTASH

For the absorption of moisture and CO_2 in the air liquefaction industry

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INNIS, SPEIDEN & CO. ISCO

117 LIBERTY ST., NEW YORK 6

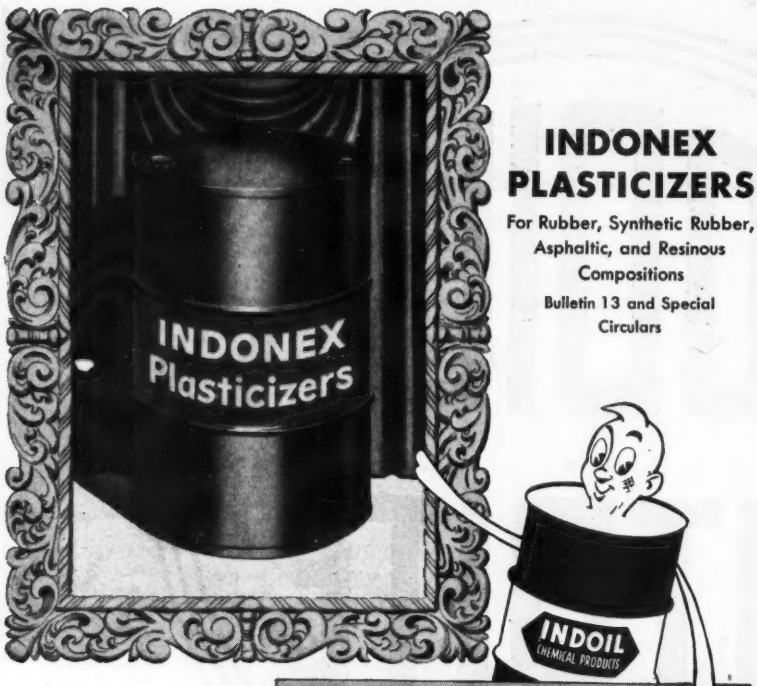
BOSTON CHICAGO CLEVELAND CINCINNATI GLOVERSVILLE PHILADELPHIA

SUBSIDIARY E. S. BROWNING CO., INC. SAN FRANCISCO • LOS ANGELES

PRIOR CHEMICAL CORPORATION - NEW YORK

420 Lexington Avenue

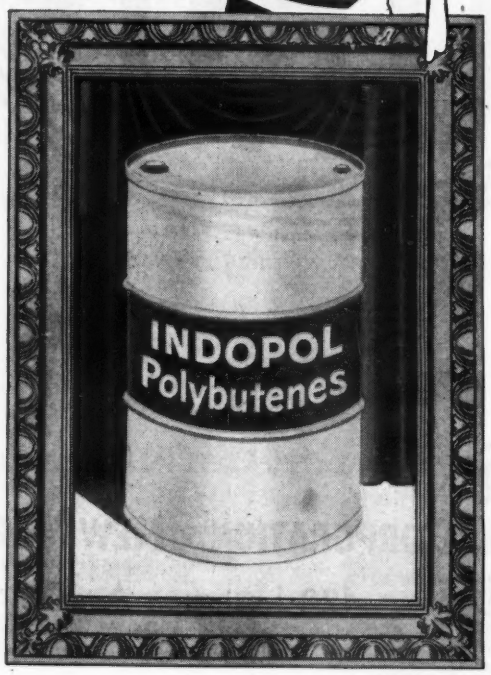
Both worth looking at-



INDONEX PLASTICIZERS

For Rubber, Synthetic Rubber, Asphaltic, and Resinous Compositions

Bulletin 13 and Special Circulars



INDOPOL POLYBUTENES

For Rubber Goods, Adhesives, Mastics, Paper Products, and Tape

Bulletin 12

INDOIL®
CHEMICAL PRODUCTS

INDOIL CHEMICAL COMPANY
910 SO. MICHIGAN AVENUE • CHICAGO, ILLINOIS

major activity will be manufacture of chlorine and caustic soda.

Paul W. Bachman (left), appointed manager of the newly formed department of development planning of The Davison Chemical Corp., Baltimore, and C. K. Banks, named director of research of the Metal & Thermit Corp., New York. Dr. Bachman's experience includes service with Du Pont, General Chemical, The Victor Chemical Works, and Commercial Solvents; Dr. Banks previously headed the chemotherapy division of Parke Davis & Co. research laboratories.

Company Notes

The Fluor Corp., Ltd., Calif., is Mathieson Chemical Corp.'s sole licensing agent for the construction of sulfur recovery plants in the United States and Canada. Fluor will nominate firms to which Mathieson will grant licenses on its processes and will supply technical information and assistance in design and operation of such plants.

The drive to manufacture and market petroleum-derived chemicals continues. Shell Chemical Corp. has opened a new technical service laboratory at Union, N. J., to further these aims.

The John Nooter Boiler Works Co., manufacturer of tanks and pressure vessels for the process industries, has changed its name to the Nooter Corp. to indicate the widened scope of its services.

The National Safety Council has given two safety awards to the Pennsylvania Salt Manufacturing Co. Pennsalt's Natrona, Pa., plant was honored for its perfect safety record during the contest year, and the Wyandotte, Mich., plant for the greatest reduction of industrial accidents.

Celanese Corp. of America won the 1949 Chemical Engineering Achievement Award for its outstanding program of postwar developments in the chemical, textile and plastics industries.

Monsanto Chemical Co.'s 1948 annual report was judged best of the chemical industry for the second consecutive year by the board of judges for the Financial World Annual Survey. Rayonier, Inc., was the runner up, while Union Carbide & Carbon Co. placed third in the chemical industry category.

The American Mineral Spirits Co. will distribute The Pure Oil Co.'s lubricating oils and greases in ten northeastern states.

A new operating division to engineer, manufacture, and sell plastics and insulating materials, known as the Lam-

Cowles CHEMICALS

DRYMET*

THE ECONOMICAL DETERGENT SILICATE

Cowles DRYMET, anhydrous sodium metasilicate, is the most highly concentrated form of sodium metasilicate available. It is more economical to use, on the basis of both Na_2O (alkalinity) and SiO_2 (silicate) than any other type of hydrated or anhydrous detergent silicate, either compounded or by itself. DRYMET contains no water of crystallization.

DRYSEQ*

THE ALL-PURPOSE DETERGENT SILICATE

Cowles DRYSEQ, anhydrous sodium sesquisilicate, is a medium pH alkaline cleaner which will do fast, dependable work at a low cost to the user. It is a white, free-flowing powder, quickly and completely soluble in hot or cold water—containing 56.75% Na_2O—making it an economical base material for compounding.

DRYORTH*

THE HEAVY-DUTY DETERGENT SILICATE

Cowles DRYORTH, anhydrous sodium orthosilicate, is a powerful, speedy, heavy-duty cleaner with valuable penetrating and wetting-out properties, reinforced dirt-removing power and unusual emulsifying action. It is an anyhdrous, free-flowing powdered silicate containing not less than 60% Na_2O, which may also be used as an economical constituent of high pH cleaning compounds.

We'll be glad to send you our DRYMET File Folder containing complete technical information and suggested formulations.

CRYSTAMET*

THE MEDIUM pH DETERGENT SILICATE

Cowles CRYSTAMET is a pure, perfectly white, free-flowing granular pentahydrate sodium metasilicate with the normal 42% water of crystallization. Suggested for compounding when it is desirable to lower the concentration of a finished product. Readily soluble—chemically stable—easy to handle. Can be used on medium pH jobs.

PROMPT SHIPMENTS FROM CONVENIENT WAREHOUSE STOCKS....

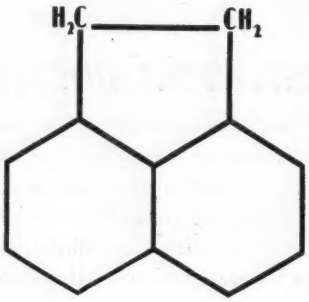
*Reg. U. S. Pat. Off.

Cowles Chemical Company

HEAVY CHEMICAL DEPARTMENT • CLEVELAND 3, OHIO

A Unique Hydrocarbon

Reilly ACENAPHTHENE



PURITY: 95% min.
BOILING POINT:
Approximately 277° at 760 mm.
FREEZING POINT: 91° C.
SOLUBILITY:
Insoluble in water. Soluble in most common organic solvents including alcohols, ethers, ketones, esters, aliphatic and aromatic hydrocarbons, and chlorinated aliphatic and aromatic hydrocarbons.
Shipping Containers: 200 lb. (approx.) barrels

Reilly Acenaphthene may be nitrated, sulfonated, halogenated and otherwise processed. The oxidation of Acenaphthene gives Naphthalic Acid, a dibasic acid which reacts to give interesting resins of the alkyd type. Partial oxidation gives Acenaphthenequinone, a reactive compound which is a starting material for several vat dyes. Dehydrogenation yields Acenaphthylene, a monomer which readily polymerizes to a high melting point polymer having unusually good electrical insulating properties. Acenaphthylene is also applicable as a rubber extender, compatible alike with natural and synthetic rubbers.

These chemical reactions suggest the many possibilities which this unique hydrocarbon offers research workers in rubber, paints, dyestuffs dielectric materials and other organic syntheses. Your inquiries on Acenaphthene, or any other coal tar chemicals, are invited.

OTHER *Reilly* HYDROCARBONS

Anthracene **Fluoranthene** **Fluorene**
1—Methylnaphthalene **2—Methylnaphthalene**
Naphthalene **Phenanthrene**

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Reilly Coal Tar Chemicals For Industry

inated and Insulating Products Div., has been established as the third operating unit of the chemical department of the General Electric Co. Its headquarters will be in Coshocton, Ohio.

The Minnesota Mining & Manufacturing Co. has just occupied two new combination branch office and warehouse units in Ridgefield, N. J., and Grand Rapids, Mich. Both were built according to 3M specifications by builder-owners from whom they are leased.

Wm. G. Boales & Associates, Detroit, has been named Michigan representative for the Cooper Alloy Foundry Co., Hillside, N. J.

Onyx Oil & Chemical Co., Jersey City, has moved its New England office from Providence to Boston, a more centralized location.

Russell M. Pickens (left), elected vice-president in charge of sales for Rayonier Inc., and John H. Karrh, appointed sales manager of the fiber division of Virginia-Carolina Chemical Corp. Dr. Pickens has been technical sales director; Mr. Karrh was president and general manager of Applications Research, Inc.

CALENDAR *of* EVENTS

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, 116th annual meeting, Hotel Statler, New York City, Dec. 26-31.
AMERICAN COUNCIL OF COMMERCIAL LABORATORIES, annual meeting, Miami, Fla., Dec. 5-7.
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, annual meeting, William Penn Hotel, Pittsburgh, Pa., Dec. 4-7.
COMPRESSED AIR AND GAS INSTITUTE, The Drake, Chicago, Dec. 12-14.
EXPOSITION OF CHEMICAL INDUSTRIES, Grand Central Palace, New York City, Nov. 28-Dec. 3.
NATIONAL ASSOCIATION OF INSECTICIDE AND DISINFECTANT MANUFACTURERS, annual meeting, Mayflower Hotel, Washington, D. C., Dec. 5-6.
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS, annual meeting, Houston, Texas, Dec. 8-10.
SOCIETY OF COSMETIC CHEMISTS, fall meeting, Savoy Plaza, New York City, Dec. 8.
SOCIETY OF PLASTICS ENGINEERS, Hotel Carter, Cleveland, Ohio, Jan. 11-13.
SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION, annual meeting, Commodore Hotel, New York City, Dec. 7.

PERSONNEL

Company Officers

• **Monsanto Chemical Co.** has elected Charles Allen Thomas chairman of its five-man Executive Committee. He has

SOLVENT VAPOR DRYING PROCESS DRIES WOOD IN HOURS WITHOUT DETERIORATING EFFECTS

Heretofore wood has been dried in open air, by steam, or by high temperature air. Open air drying takes 6 to 18 months; steam and high temperature air often result in hydrolysis or burning. Now, one of the country's largest wood preserving plants has developed a Vapor Drying process which safely and effectively dries wood in from *6 to 14 hours!* The drying agent used is *Esso's Solvesso Xylol.*

The drying process begins when a locomotive pushes a charge of crossties, approximately 100 feet long, into a cylinder or drying chamber. At the proper time, vaporized Solvesso Xylol is passed into the drying cylinder. The hot Solvesso Xylol vapor is circulated through the cylinder for a few hours, penetrating many inches into the wood and evaporating much of its moisture.

As "dry cleaning" and moisture evaporation continue, the solvent vapor with its moisture-lignin content leaves the cylinder and is condensed, separating the solvent from the water in the settling tank and returning the Solvesso Xylol to the evaporator to be reused. (see diagram)

5 Gallons of Water from One Crosstie

The amount of water removed from the settling tank determines the relative dryness of the wood being treated. When drying is finished, the Solvesso Xylol lines are closed, the chamber evacuated and the wood is ready for treatment with wood preservative. Water from the settling tank is passed through a meter, which is read periodically to determine wood drying progress. One charge of 800 crossties may be made to give up as many as 4,000 gallons of water—or *5 gallons per crosstie*—in a 12-hour drying period.

Esso Solvents Play Vital Role in Scores of Industries

Rubber, textiles, chemicals, paper, food, leather and scores of other industries are utilizing the many types and grades of solvents manufactured by Esso Standard Oil. Production men know they can rely on Esso Petroleum Solvents' purity and uniformity, maintained through most modern and stringent refinery treatment. If you have a solvents problem, let our technical men examine your requirements and determine the solvent best suited to your needs. Drop a line today to our office nearest you.

Paper Mill Machinery now Cleaned with Solvesso 100

Solvesso 100 is now being used to clean paper machine screens and felts when they become congested with natural wood pulp gums and resins. Since paper machines are operated at extremely high temperatures, Solvesso 100's high flash point (over 100°F.) makes it ideally suited. In addition, Solvesso 100 has especially high solvency for resins since it contains more than *95% petroleum aromatics.*

Before they were creosoted, the crossties in this picture were dried by a new vapor process employing Solvesso Xylol.

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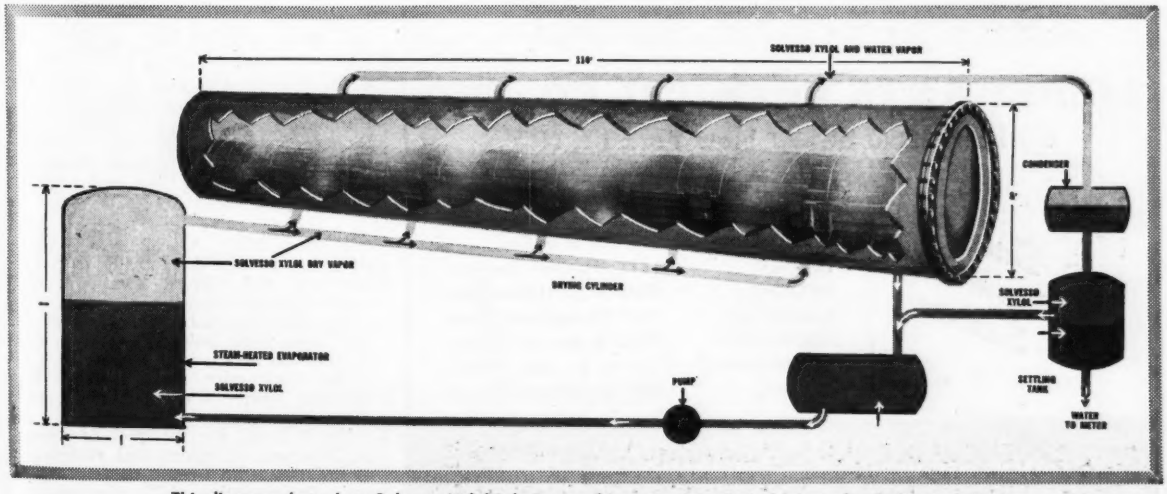
ESSO STANDARD OIL COMPANY OF PENNSYLVANIA—Philadelphia, Pa.



This diagram shows how Solvesso Xylol is being used in new vapor drying process for drying crossties.

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LOUISVILLE	1301 W. Jefferson Street
MILWAUKEE	1100 S. Barclay Street
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been executive vice-president of Monsanto since May, 1947.

As president of the company, William M. Rand remains a member of the Executive Committee. He has been chairman since October, 1946.

• **Atlas Mineral Products Co.** has elected A. Myles Younger vice-president in charge of sales. He joined the firm as a chemical engineer in 1939 and in the interim has held positions as midwest sales manager, plant manager of the California plant, general manager of the Texas Division, and general sales manager.

Production

• James J. Pyle, until this week manager of the new products development laboratory of the Chemical Department of the **General Electric Co.**, has been appointed division engineer of a newly-established division, the Laminated and Insulating Products Division. Dr. Pyle will move to Coshocton, Ohio, where headquarters for the division are being established. T. Norman Willcox has been named manufacturing and materials engineer for the division.

• William L. Walsh has been named assistant general manager of the General Aniline Works' (dyestuffs) Division of **General Aniline & Film Corp.** He joined the staff at Rensselaer as a research chemist in 1936 and has recently been plant manager.

• Julius Kovitz has been appointed general manager in charge of all chemical and metallurgical operations at the **Brooklyne Chemical Works, Inc.** of Baltimore, Md. He has been associated with Brooklyne since 1941, with the exception of the time that he served with the Chemical Corps during the war.

• Roy E. Paul has been named superintendent of **Victor Chemical Works'** Tarpon Springs, Florida, plant. He has been with the company since 1929.

• The **Du Pont Co.** has appointed George D. Graves director of the department's chemical division. He succeeds John Marshall, who died on August 27. Dr. Graves has been with the Du Pont Company for more than 22 years, and since 1945 has been assistant director of the chemical division of the Plastics Department.

• Richard A. Claussen has been appointed technical superintendent of the Pittsburgh, California, factory of **Pioneer Rubber Mills.** He was formerly manager of the New Products Laboratory, General Tire and Rubber Co.

• Walter Hull Aldridge has been elected to receive the **John Fritz medal** for 1949, the highest award in the engineering profession.

Mr. Aldridge has been president of the Texas Gulf Sulphur Co. for more than thirty years, is a trustee of Columbia University, and holder of the honorary degree doctor of science and other honors.

He is cited for the present award as "engineer of mines and statesman of industry who by his rare technical and administrative skills has import-

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Color, 4OY-6R Max; Acid Value, 3-6;
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Fast-drying, waterproof, non-yellowing oil for varnishes, enamels, alkyds.

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Castor Oil (U. S. P.)

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For sulphonation, plasticizing, etc. Also used for cosmetics and soaps.

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Viscosity, U.

Pure castor oil for industrial use only where color and the lowest acid value are not important.

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Odorless and tasteless. The oil par excellence for medicinal use, cosmetics, hair tonics, and all uses where castor oil taste and odor are objectionable.

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Viscosity, 1300-1400 SUS 100° F.

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antly augmented the mineral production of our country and Canada."

Sales

• Earl J. Mills, manager of less-carload sales for **Diamond Alkali Co.** at the Chicago sales office, has been appointed as manager of the company's Southwest sales district, which includes Texas, Oklahoma, and Kansas.

Charles W. Klaus, manager of carload sales at Chicago since 1947, has been given complete charge of Diamond's sales activities affecting the seven-state areas of Illinois, Indiana, Iowa, Michigan, Minnesota, Wisconsin and Nebraska.

• John G. Wild has been appointed assistant sales manager of **Prufcoat Laboratories, Inc.**, of Cambridge, Massachusetts.

• J. T. Murnane has been appointed industrial sales manager for **Pittsburgh Plate Glass Co.'s** paint division at Newark, N. J. He has represented the firm in the Baltimore district until his present appointment.

• Walter M. Clark, director of the National Clean Up-Paint Up-Fix Up Bureau, has resigned his position to become director of merchandising of the **Nuodex Products Co., Inc.**, Elizabeth, N. J. He will be responsible for selecting products in the Nuodex line which have promotional possibilities for marketing through paint manufacturers and directing the market research and sale of such products.

Elmer Carling (left), eastern regional sales manager of the pigment department, American Cyanamid Co., Calco Chemical Division, promoted to assistant sales manager, and Walter A. Spencer, appointed midwestern sales representative for Arnold, Hoffman & Co., Inc., Providence.

• **American Cyanamid Co.** has appointed L. P. Moore manager of its New Products Development Department. The firm also announces the appointment of E. W. Cook as its European technical representative.

Dr. Moore has served as the company's European technical representative since 1946. His new work will be devoted to the supervision of new products development and market research activities with special emphasis on finding applications for new products coming from the laboratories.

• Earl H. Cone, Jr., has been named sales manager for the newly combined Industrial Chemicals Division and Dairy Products Division, **Hercules Powder Co.**, and Don C. Nicholson has been named assistant sales manager of the combined divisions.

Research

• Curtis E. Maier, formerly assistant to the vice president in charge of research and engineering, **Continental Can Co.**, has been named general manager of research. He has been a member of the Continental organization since 1937, prior to which he was assistant manager of research of the Hazel Atlas Glass Co.

• **Metal Hydrides Inc.**, Beverly, Massachusetts, has named M. D. Banus associate director of chemical research. He acquired his doctorate in inorganic chemistry from M. I. T. in 1949 and was a Moore Fellow.

• Two English chemists have been appointed guest fellows of the Coal Research Laboratory at **Carnegie Institute of Technology.**

John David Francis Marsh of London and Stephen Hesling of Bingley (Yorkshire) have been given one-year

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC. REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946

Of *Chemical Industries*, published monthly at Philadelphia 4, Pa., for September 15, 1949.

State of New York, County of New York, ss.

Before me, a Notary Public in and for the State and County aforesaid, personally appeared Robert L. Taylor, who, having been duly sworn according to law, deposes and says that he is the Editor and Manager of *Chemicals Industries* and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, MacLean-Hunter Publishing Corporation, 522 Fifth Avenue, New York 18, N. Y.; Editor, Robert L. Taylor, 522 Fifth Avenue, New York 18, N. Y.; Managing Editor, H. C. E. Johnson, 522 Fifth Avenue, New York 18, N. Y.; Business Manager, W. Alec Jordan, 522 Fifth Avenue, New York 18, N. Y.

2. That the owner is: MacLean-Hunter Publishing Corporation, 522 Fifth Avenue, N. Y. The stockholders of the Maclean-Hunter Publishing Corporation are: E. R. Gauley, 808 Junior Terrace, Chicago 13; J. L. Frazier, 2043 Orrington Ave., Evanston, Illinois; Col. J. M. Maclean, 7 Austin Terrace, Toronto, Ontario; Horace T. Hunter, 120 Inglewood Drive, Toronto; Maclean-Hunter Pub. Co., Ltd., 481 University Avenue, Toronto.

3. That the known bondholders, mortgagees, and other security holders, owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholders or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

ROBERT L. TAYLOR,
Editor and Manager.

Sworn to and subscribed before me this 15th day of September, 1949. Peter J. Michel, Notary Public, N. Y. Co. Clk. #877, Reg. #594-M-9. Commission expires March 30, 1951.

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- **HYDRAZINE HYDRATE 85% 100%**
- **HYDRAZINE SULFATE COMMERCIAL and C.P.**

  Use: Manufacture of intermediates for dyes and pharmaceuticals. Hydrazine Base has solvent properties similar to liquid ammonia.

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  Use: Isolation of ketones and aldehydes, forming well-defined crystalline compounds.

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  Use: The stabilized Diazo Salts are used together with the Dye Components for coating light sensitive diazo type papers.

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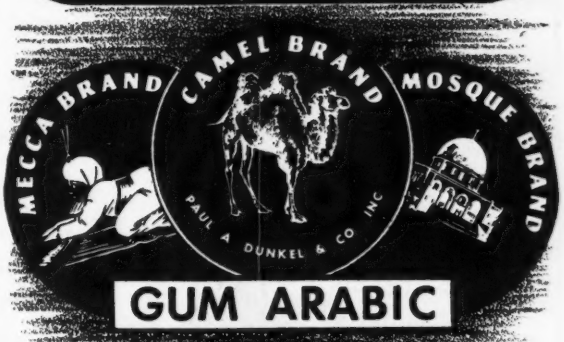

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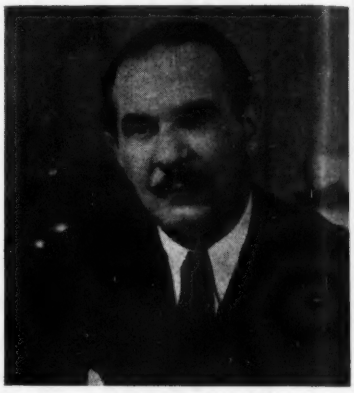
appointments as visiting research fellows.

Mr. Marsh has been a research chemist for Fulham Gas Light and Coke Co. and the North Thames Gas Board. Mr. Hesling worked as a development chemist with the Anglo-Iranian Oil Company for two years.

• R. A. V. Raff, a specialist in high polymer research, has been appointed to a new fellowship on plastics established in **Mellon Institute** by Koppers Co., Inc. Dr. Raff was previously for eight years in the employ of the Howard Smith Paper Mills, Ltd., Cornwall, Ontario.



Fred R. Firstenberg, president of the First Machinery Corp., one of the prime movers in the establishment of the Process Equipment Dealers Council, an association recently formed to advance the interests of machinery dealers throughout the country. A dinner will be held Nov. 30 at the Hotel Bristol, N.Y.C., so that those attending the 22nd Exposition of Chemical Industries may affiliate with the new group.

Associations

• The **American Wax Importers and Refiners Association, Inc.,** has elected the following officers: president, A. J. Bohart, Stein, Hall & Co., Inc.; vice-president, J. L. deLyra, Wessel Duval & Co., Inc.; secretary, J. J. Garvey, Mamaroneck Chemical Corp.; treasurer, W. Gantenbein, Distributing & Trading Co., Inc.

• The **Association of Consulting Chemists and Chemical Engineers** has elected the following officers: president, Percy E. Landolt, consulting chemical engineer; vice-president, Stephen Laufer, Schwarz Laboratories, Inc.; treasurer, Rober S. Aries, consulting chemical engineer; secretary, Albert Parsons Sachs, consultant.

• Harold C. Green, L. Sonneborn Sons, Inc., has been elected chairman of the **Drug, Chemical and Allied Trades Section** of the New York Board of Trade at its 59th annual meeting. Other officers who will serve during tthe next fiscal year are: vice-chairman, Charles P. Walker, Jr., Citro Chemical Co.; treasurer, Hugh S. Crosson, McKesson & Robbins Inc. (re-elected); secretary, Helen L. Booth (re-elected). Carl M. Anderson, assistant to president, Merck & Co., Inc., was re-appointed counsel.

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Some of the products of the many possible Acrolein reactions are listed here. If you are working with any of these, we suggest that you investigate the advantages *and new economies* of Acrolein. We will be glad to discuss the use of Acrolein in your processes.

PROPERTIES

Molecular Weight	56.06
Specific Gravity 20/4°C.	0.8389
Melting Point	−86.9°C.
Boiling Point	52.7°C.
Flash Point, Tag Open Cup	Below 0°F.

Colorless . Soluble in alcohol and ether

REACTIONS OF THE CARBONYL GROUP

Reactant	Conditions of Reaction	Products of Reaction
KCN	Glacial acetic acid in ether solution	$CH_2{=}CH{-}\overset{OH}{\underset{|}{C}}H{-}CN$ acrolein cyanohydrin
Malonic acid	Pyridine solution	$CH_2{=}CH{-}CH{=}CH{-}COOH$ 2,4–pentadienoic acid
Acetic anhydride	In presence of acid	$CH_2{=}CH{-}\overset{O}{\underset{|}{C}}H{-}O{-}\overset{O}{\overset{\|}{C}}{-}CH_3$ acrolein diacetate
C_2H_5MgBr	Grignard solution	$CH_2{=}CH{-}\overset{OH}{\underset{|}{C}}H{-}C_2H_5$ 1–penten–3–ol
HCl (dry)	Low temperature	$Cl{-}CH_2{-}CH_2{-}CHO$ β–chloropropionaldehyde

REACTIONS OF THE DOUBLE BOND

Furan	Presence of SO_2 and high temperature	2–furanpropionaldehyde and 2,5–furandipropionaldehyde
Cyclopentadiene	Elevated temperatures	2,5–endomethylene–1,2,5,6–tetrahydrobenzaldehyde
RSH	—	$R{-}S{-}CH_2{-}CH_2{-}CHO$ β–alkylthiopropionaldehyde
Phenol	In presence of acid or dilute alkali	aldehyde type resins

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Packaging & Shipping

(*Continued from page 790*)

specification packaging, marking, and labeling requirements, for transportation by rail express.

The purpose of this amendment is to provide additional containers for shipments of alkaline corrosive liquids, n.o.s., alkaline caustic liquids, n.o.s., and alkaline battery fluids, as well as exempt small quantities of these materials from requirements.

Section 73.252C has been added as follows:

73.252C *Bromine pentafluoride.* (a) Bromine pentafluoride, when offered for transportation by carriers by rail freight, highway, or water, must be packed in specification containers as follows:

(1) Spec. 3E1800 or 4B240. Cylinders not over 120 pounds water capacity (nominal), filled to not over 210 percent of water capacity. Cylinders must be plugged and fitted with valve protection caps. Spec. 3E1800 cylinders must be packed in strong outside wooden boxes and contain not more than one pound of bromine pentafluoride.

(b) Bromine pentafluoride, when offered for transportation by rail express must be packed in specification containers as follows:

(1) Spec. 3E1800 or 4B240. Cylinders containing not more than one pound of bromine pentafluoride. Cylinders must be plugged and fitted with valve protection caps and must be packed in strong outside wooden boxes.

The purpose of this amendment is to provide specific packaging requirements for shipments of bromine pentafluoride.

Paragraph (b) (3) to section 73.263, formerly section 263, has been added as follows:

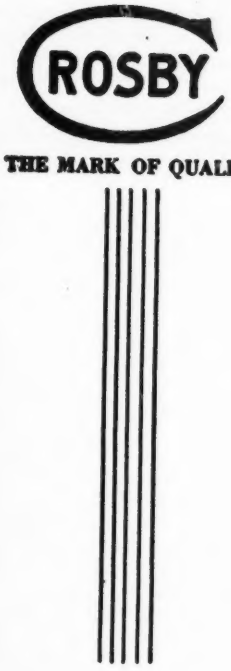
(b) (3) Inside containers of not more than 8-fluid ounces capacity each, resistant to lading, packed in strong outside containers, and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in the event of breakage, are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

The purpose of this is to exempt small quantities of hydrochloric (muriatic) acid and hydrochloric acid mixtures.

Section 73.273, formerly section 273, has been amended as follows:

(c) (2) Spec. 12B. Fiberboard boxes with inside containers of India rubber, lead, polyethylene, or other hydrofluoric acid resistant plastic not over one pound capacity each. These containers are authorized only for strength of acid for which they are adequate, but in no case shall the strength of acid exceed 65 percent.

The purpose of this amendment is to provide an additional shipping container for hydrofluoric acid.



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Section 73.268, formerly section 268 deals with packing and shipping of nitric acid in various concentrations and has been rewritten in order to clarify specific containers authorized for various concentrations of nitric acid. Shippers of nitric acid should consult the Regulations, section 73.268, for the complete content of this revision.

Section 73.272, formerly section 272, has been amended by addition of subparagraph (o) as follows:

(o) Sulfuric acid solutions not over 25 percent concentration in inside containers of not more than 8-fluid ounces capacity each, resistant to lading, packed in strong outside containers, and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in the event of breakage, are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

The purpose of this amendment is to exempt small quantities of sulfuric acid.

Section 73.273, formerly section 273, has been amended as follows:

Add: (d) ICC 103A or 103A-W tank cars. Authorized only for stabilized sulfur trioxide. Cars equipped with interior heater coils not permitted.

The purpose of this amendment is to provide for bulk shipment of stabilized sulfur trioxide.

Section 73.279, formerly section 279, *Anisoyl chloride,* has been amended as follows:

73.279 *Anisoyl chloride* (a) Anisoyl chloride must be packed in specification containers as follows:

(1) Spec. 5C. Metal barrels or drums.

(2) Spec. 5G. Metal barrels or drums with flanges for closures welded in place.

(3) Inside containers of not more than 8-fluid ounces capacity each, resistant to lading, packed in strong outside containers, and cushioned with absorbent material in sufficient quantity to completely absorb liquid contents in the event of breakage, are exempt from specification packaging, marking, and labeling requirements for transportation by rail freight, rail express, or highway. When for transportation by carrier by water they are exempt from specification packaging, marking other than name of contents, and labeling requirements.

The purpose of this amendment is to provide specific requirements for a new commodity.

Section 73.303 (k), formerly section 303 (k), has been amended by adding sulfur hexafluoride which can be shipped in cylinder ICC-3A1800; ICC-3 with maximum permitted filling density of 110 percent.

(The amendments to the ICC Rules and Regulations will be continued in a subsequent issue.—EDITOR.)

A page from the Stauffer Catalog

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Grades . . . . . NSC 100 DETERGENT (*Regular*): contains caustic soda and sodium phosphate in a selected proportion to suit most uses. Available in "Green" or "White" flake..

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Caution:—The relatively high percentage of caustic alkali in NSC DETERGENTS makes them unsafe for use in manual dishwashing or for home laundering and dishwashing machines.

Packing . . . . . Steel Drums, with special 14 inch opening in head to permit easy removal of small amounts as needed.

Net content — 400 lbs. Gross content — 422 lbs.

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CHEMICAL MARKETS

Export Market Shift

Export markets for U. S. chemicals and pharmaceuticals have been shifting markedly from South America to Europe and the Near and Far East in recent months, according to Frederick W. Richmond, president of the United States Foreign Corp., New York City.

Exports of U. S. drugs to South America have dropped more than ten per cent during the past twelve months, and industrial chemicals even further, Mr. Richmond said, due entirely to the tightness of the dollar exchange situation in major South American markets. He pointed out that U. S. exporters who have done business in South American markets frequently have had to wait as much as a year for dollar allocations and payments.

European countries, on the other hand, have ECA funds available, and—in line with U. S. rehabilitation efforts in Europe—these funds are readily obtainable.

Before the war, Europe supplied the Near and Far East with the great majority of its chemicals. However, due to curtailed European production, coupled with the urgent need for drugs and chemicals in the East, U. S. exporters have come into the market, and are today supplying them with very large quantities.

Market Review

Both the steel and coal strikes cast long shadows in the chemical industry last month as producers and consumers pondered the effect of long stoppages. In addition, the world-wide currency devaluations ushered in a period of uncertainty and watchful waiting, particularly to determine the pattern of values in terms of replacement costs of imported raw materials. Volume of trade was maintained at recent levels, and the overall price trend continued downward.

First to feel the effects of the strikes were coal chemicals, especially benzene, toluene, and xylene. These were in brisk demand as consumers attempted to build stocks against a prolonged stoppage. Buyers of coaltar toluene and xylene who sought to protect inventories with petroleum-derived material generally had to wait until suppliers took care of long-established customers. Phthalic anhydride continued tight as producers strove for top capacity. This commodity, too, was imperiled as naphthalene tightened.

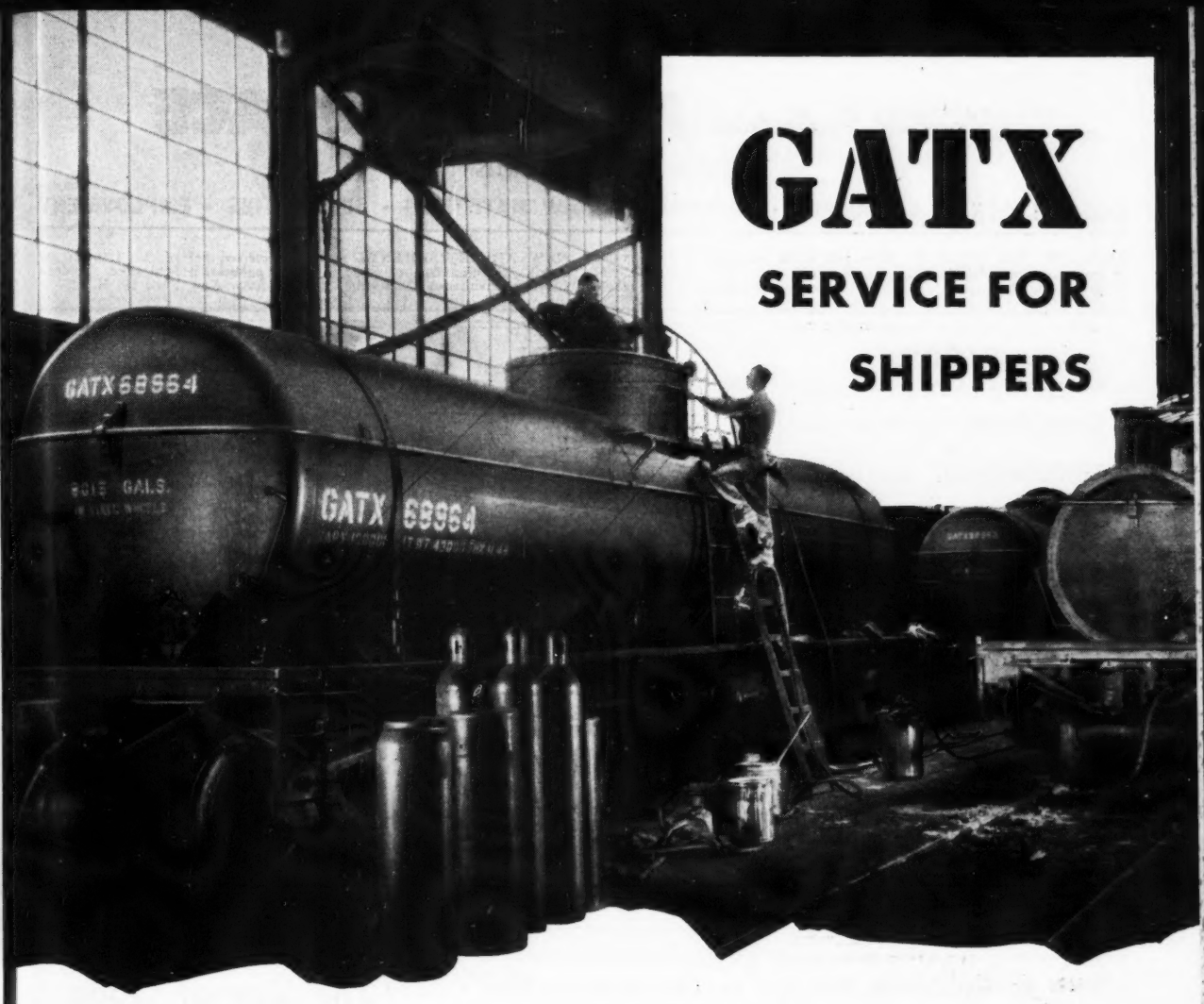
Effects of coaltar chemical shortages were expected to be felt in the protective coatings, adhesives, and plastics fields for it was evident that phenol producers would soon be squeezed by short benzene supplies. Styrene would also be hit by a long continuation of the strikes.

Reductions in lead pigments followed the break in lead prices due to decreased demand for lead and foreign offerings at prices below domestic prices. Lead acetate was also reduced from $22.75 per cwt. to $20 for the crystal form, from $23.50 to $20.75 for the granular, and from $23.50 to $20.75 for the powdered. A reduction in antimony was reflected in sharp reductions for antimony oxide, with the ceramic grade reduced four cents to 27¢ per lb., and the pigment grade seven cents to 27¢ a lb. A reduction of 4.3¢ per lb. in the price of sodium stannate established the carlot price in drums at 53.7¢ per lb.

Chlorine continued to be the exception among heavy chemicals as it remained in rather tight supply. Pricewise, a leading feature was a lower price for soda ash, the first change in this commodity since the first of the year. The reduction which amounted to $2-$3 per ton, established prices at $1 cwt. for the light, bulk material, and $1.10 per cwt. for the dense, bulk material, f.o.b. works. These prices are to hold for one carload or more, regardless of the total consumption of the buyer.

There were several important price reductions among fine chemicals. Iodides were reduced 11¢-25¢ per lb., establishing potassium iodide at $1.95 per lb., sodium iodide at $2.47 per lb., resublimed iodine at $2.30 per lb., tincture of iodine at $1.95 per gal., and ammonium iodide at $3.79 per lb. Devaluation of the Dutch guilder resulted in the first price change in quinine in several years. Quinine sulfate and quinidine sulfate were reduced from 80½¢ and $1.35 per oz. to 56½¢ and $1.25 per oz. respectively. This was followed by a general reduction in a number of quinine salts.

Reductions ranging up to $1 per gal. in the price of its weed killers by The Dow Chemical Co. were among the few price developments in agricultural chemicals. Another was a $3 per lb. reduction in the price for Chilean nitrate of soda, which established a price of $48 per ton in bulk.



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1 7"—43'7½" center
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1 7"—33'10¼" center

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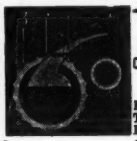

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(Continued from page 717)

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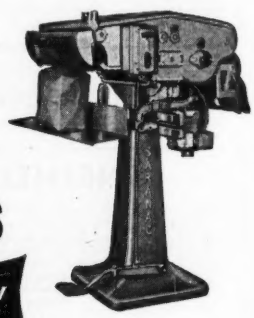

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Abstracts of United States Patents

A Complete Checklist Covering Chemical Products and Processes

Printed copies of U. S. patents are available from the Patent Office at 25 cents each. Address the Commissioner of Patents, Washington, D. C., for copies and for general information concerning patents or trade-marks.

U. S. Patents from Official Gazette—Vol. 624, Nos. 1, 2, 3, 4, (July 5-26)

Coatings

Protecting the surfaces of metal articles composed principally of aluminum by cleaning the surfaces; immersing the cleaned articles to be treated in an aqueous solution of which at least one selenium compound selected from the group which consists (as introduced into said aqueous solution) of selenium dioxide, selenious acid, the alkali and zinc salts thereof, selenic acid, and the alkali and zinc salts thereof, at least one zinc compound selected from the group which consists (as introduced into said aqueous solution) of zinc chromium selenate ($Cr_2(SeO_4)_3ZnCrO_4$), zinc oxide, zinc selenate, zinc selenate, zinc selenite and zinc phosphate, and phosphoric acid to dissolve all the zinc compound present. No. 2,475,945. Charles W. Clark and Thomas Garnet Collins (to Canadian Copper Refiners Ltd.).

Protecting the surfaces of metal articles composed principally of aluminum, by cleaning the surfaces of the metal to be protected; immersing the cleaned articles to be treated in an aqueous solution of at least one selenium compound selected from the group which consists (as introduced into said aqueous solution) of selenium dioxide, selenious acid, the alkali and zinc salts thereof, selenic acid, and the alkali and zinc salts thereof, at least one zinc compound selected from the group which consists (as introduced into said aqueous solution of zinc chromium selenate, zinc oxide, zinc selenate, zinc selenite and zinc phosphate, phosphoric acid to dissolve all the zinc compounds present, and propylene glycol. No. 2,475,946. Charles W. Clark and Thomas Garnet Collins (to Canadian Copper Refiners Ltd.).

Coating compound consisting of a mechanical mix of asphalt varnish and asphalt gilsonite varnish, oil of the class consisting of drying and semi-drying oils, and asbestos fiber, said mix having incorporated metallic flakes. No. 2,476,178. Overton J. Cahill (to Alfred E. Braun).

Bath for imparting a black coating to stainless steel by adding in aqueous solution a composition of a permanganate, a hydroxide, a sulphite, and a sulphate, each of said compounds having a metallic constituent chosen from the alkali metal group and sufficient water. No. 2,476,700. Daniel J. Clini (to Heatbath Corp.).

Production of a hydrocarbon mixture containing polyolefinic, polycyclic hydrocarbons, the unsaturated bonds of which are non-aromatic and in conjugated as well as non-conjugated relation to each other, which comprises contacting an olefinic hydrocarbon containing at least 4 carbon atoms with a hydrogen fluoride catalyst. No. 2,476,955. Herman S. Block (to Universal Oil Products Co.).

Preparing a spirit varnish by dissolving a zinc salt of polymeric fat acids in a volatile organic solvent in the presence of an organic amine. No. 2,477,116. John C. Cowan and Howard M. Teeter (to U. S. A. by Secretary of Agriculture).

Composition for producing a corrosion resistant coating having good dye affinity on the surface of zinc and high zinc alloys which comprises a water soluble chromium trioxide-containing compound selected from the class consisting of chromic acid and salts thereof. No. 2,477,310. Earle R. McLean and David M. Jenkins, Jr. (to Clark Thread Co.).

Detergents

Separating material containing saponifiable acids combined with alkali from waste pulp liquor and recovering a purified soap. No. 2,475,361. Benjamin H. Thurman (to Benjamin Clayton).

Detergent composition comprising an alkali metal salt of a mixture of sulfonated arylsubstituted alkanes consisting essentially of sulfonated monophenyl-substituted alkanes having an alkane structure corresponding to a mixture of acyclic polypropylenes, said polypropylenes having a branched chain structure resistant to fragmentation under alkylating conditions in the presence of anhydrous hydrofluoric acid catalyst. No. 2,477,383. Allen H. Lewis (to California Research Corp.).

Dyes & Pigments

Production of dyed textile materials having a basis of a synthetic linear polyamide condensation product, by dyeing with a direct dyeing dyestuff which is relatively insoluble in water and which is applied in the form of aqueous dispersions and then subjecting the dyed textile to steaming. No. 2,474,890. Cyril M. Croft (to Celanese Corp. of America).

Fixing pigments on artificial textile material by applying an aqueous paste, comprising the pigment, an organic acid of low volatility and a water-soluble condensation product of formaldehyde and a substitution product of biguanide obtainable by heating dicyandiamide with ethylene diamine dihydrochloride. No. 2,474,909. H. C. Olpin, P. B. Law and S. A. Gibson (to Celanese Corp. of America).

Preparing symmetrical rhodacarbocyanine dyes by reacting in the presence of an acetanilide a quaternary salt of a thiazole selected from the group consisting of a 2-methylbenzthiazole and a 2-methylnaphthiazole, with one mol each of ethyl orthoformate and a rhodanine. No. 2,475,163. Thomas Robert Thompson (to General Aniline Film Corp.).

Dinitro monoazo compound. No. 2,475,228. Friedrich Felix and Ernst Reich (to Ciba Ltd.).

Phosphorescent pigment comprising the product of heat treating a mixture consisting of an alkaline earth metal sulfide of the group consisting of calcium sulfide and strontium sulfide and containing minute amounts of a bismuth salt and a copper salt. No. 2,475,437. Ferdinand Stern.

Metallizable benzimidazole azo dyestuffs. No. 2,475,506. Charles E. Lewis (to American Cyanamid Co.).

Manufacture of anthraquinone dyes by reacting an amine sulphonic acid compound of the group consisting of alpha:beta-diphenylethyl-aminemonosulphonic acid, 2-benzyl-cyclo-hexylaminemonosulphonic acid, alpha-phenyl-gamma-aminobutanemonosulphonic acid, 4-chloro-alpha:alpha-diphenylmethylaminemonosulphonic acid, and their alkali metal salts, with an anthraquinone compound of the group consisting of quinizarin, 1:4:5-trihydroxyanthraquinone, 1:4:5:8-tetrahydroxyanthraquinone and 1:4-diaminoanthraquinone in aqueous medium and in the presence of an alkali. No. 2,475,530. William Wyndham Tatum (to Imperial Chemical Industries Ltd.).

Converting an indigold vat dyestuff having at least one thionaphthene nucleus into very finely divided particles by forming a slurry of the dyestuff with sulfuric acid, agitating this slurry until conversion of the dyestuff to the substantially insoluble sulfate is complete, and hydrolyzing the sulfate to the dyestuff. No. 2,475,821. John F. Cullinan and Lawrence D. Lytle (to American Cyanamid Co.).

Disazo dye from dihydroxy benzidine. No. 2,476,259. Hans Mayer and Willy Widmer (to Ciba Ltd.).

Manufacture of a disazo dyestuff by coupling tetrazotized 3:3'-dihydroxy-4:4'-diaminodiphenyl with a hydroxynaphthalene capable of coupling in a position vicinal to a hydroxyl group and containing in addition to the hydroxyl group as the sole further substituent a substituent selected from the group consisting of a second hydroxyl group and an—SO_2NH_2—group, in the presence of pyridine. No. 2,476,260. Hans Mayer and Willy Widmer (to Ciba Ltd.).

Manufacture of an asymmetrical polyazodyestuff by coupling a diazoazo-compound obtained from tetrazotized 3:3'-dihydroxy-4:4'-diaminodiphenyl and a coupling component containing a sulfonic acid group and capable of coupling in a position vicinal to a hydroxyl group in a naphthalene ring with a hydroxynaphthalene free from sulfonic acid groups and capable of coupling in a position vicinal to a hydroxyl group in the presence of pyridine. No. 2,476,261. Hans Mayer and Willy Widmer (to Ciba Ltd.).

Production of leuco vat dyestuffs capable of dyeing from substantially neutral aqueous solution, by reducing a vat dyestuff to the leuco form in an alkaline vat, and adding an organic liquid non-solvent for said leuco dyestuff to said vat so as to cause said leuco vat dyestuff to precipitate from the vat in which it is reduced in the form of a water-soluble leuco vat dyestuff. No. 2,476,287. Cyril M. Croft and Walter H. Hindle (to Celanese Corp. of America).

Trinuclear cyanine dyes. No. 2,476,525. Alfred W. Anish and Charles A. Clark (to General Aniline & Film Corp.).

Amino anthraquinone dyestuffs containing an amino stilbene group. No. 2,476,642. Curt G. Vogt (to General Aniline & Film Corp.).

Textile decorating composition comprising an emulsion, the inner phase of which comprises a water-immiscible solution of a plurality of film-forming substances dissolved in a volatile water-immiscible organic solvent, one of the film-forming substances being of the class of elastomers consisting of natural rubber and chloroprene and isobutylene polymers. No. 23,134. Norman S. Cassel (to Interchemical Corp.).

Coloring composition consisting essentially of monochloro-copper-phthalocyanine and a tin-phthalocyanine compound as an auxiliary color, said coloring composition being characterized by stability against flocculation when incorporated in a liquid pigmenting composition. No. 2,476,950. Earl Edson Beard (to E. I. du Pont de Nemours & Co.).

Coloring composition consisting of chlorine-free copper-phthalocyanine and tin-phthalocyanine as an auxiliary color, said coloring composition being characterized by stability against flocculation when incorporated in a liquid pigmenting composition. No. 2,476,951. Earl Edson Beard (to E. I. du Pont de Nemours & Co.).

Composite lead sulfate-lead silicate pigment. No. 2,477,277. Francis J. Williams and Adrian R. Pitrot (to National Lead Co.).

Disazo pyrazolone dyes. No. 2,477,487. Georges Kopp and Rene Gangneux (to Societe Anonyme de Matieres Colorantes et Produits Chimiques Francolor).

Explosives

Granular explosive composition comprising magnesium dispersoid protectively coated with hydrocarbon containing asphalt and an oxidizing agent. No. 2,477,549. William F. Van Loenen (to Permanente Metals Corp.).

Inorganic

Defluorinating phosphate rock by introducing phosphate rock and naturally occurring siliceous material into a hot vertical reaction. No. 2,474,831. Kelly L. Elmore (to Tennessee Valley Authority).

Preparing a synthetic gel containing silica and alumina. No. 2,474,888. Gerald C. Connolly (to Standard Oil Development Co.).

Producing caustic soda from sodium carbonate by reacting sodium carbonate and tin oxide to form sodium stannate, dissolving said stannate in water, heating the dissolved stannate whereby tin oxide and free caustic soda are formed, separating the tin oxide and recycling it, adding sodium nitrate to the remaining solution of unchanged stannate and caustic soda to form a detinning solvent, detinning tin scrap with said solvent to form additional quantities of sodium stannate and also sodium carbonate, separating the carbonate from the stannate, and recycling the carbonate to the first mentioned reaction step to react with an addiional quantity of tin oxide. No. 2,474,916. Hartmut W. Richter (to Metal & Thermit Corp.).

Preparation of silica gels of improved hardness by adding an alkali metal silicate to an inorganic acid to form an acid silica hydrosol, allowing the sol to set to a firm hydrogel, allowing the hydrogel to stand until syneresis occurs then treating the hydrogel with an aqueous solution of an alkali tartrate, washing, drying and activating the tartrate treated gel. No. 2,475,253. Jerry A. Pierce (to Standard Oil Development Co.).

Production of chlorine dioxide in dilution with an inert diluent gas by

reacting gaseous nitrogen peroxide, diluted with such diluent gas to a concentration not greater than about 10 mole percent, with a chlorite of a metal of the class consisting of the alkali and alkaline earth metals. No. 2,475,285. Willis S. Hutchinson (to Mathieson Chemical Corp.).

Production of chlorine dioxide in a state of dilution with an inert diluent gas by reacting gaseous nitrogen peroxide, diluted with said diluent gas with a chlorate of an alkali metal. No. 2,475,286. Willis S. Hutchinson (to Mathieson Chemical Corp.).

Producing potassium titanium fluoride by digesting a titanium ore with sulfuric acid to form a titanium sulfate-containing product, treating said product with calcium fluoride to form titanium fluoride, separating the resulting titanium fluoride solution from the insolubles, treating the resulting solution with an ionizable fluorine compound in the presence of potassium chloride, and separating crystals of potassium titanium fluoride. No. 2,475,287. Henry C. Kawecki (to Beryllium Corp.).

Stable dry mixed crystal salt of sodium thiosulfate and ammonium thiosulfate. No. 2,475,616. Harold E. Ingraham.

Producing an inorganic thermoplastic machinable material comprising forming a mixture containing a liquid for plasticizing the mixture, a finely divided metal borosilicate bonding agent, magnesium oxide, and a water-insoluble inorganic alkaline metal sulphate. No. 2,475,651. Karl Turk.

Producing substantially pure, dry hydrogen chloride gas by reacting sodium chloride and sulfuric acid in a furnace heated internally by hot combustion gases. No. 2,475,752. Julius E. Nachod, Owen W. Rideout and James H. Shapleigh (to Hercules Powder Co.).

Preparing a porous, non-crystalline, copper catalyst by subjecting cupric oxide particles to a pressure sufficient to cause the particles to form a compact, cohesive, self-sustaining mass, heating and thereafter subjecting the resulting cupric and cuprous oxide mixture to a pressure of 1500-2000 pounds per square inch. No. 2,475,965. David C. Hull and Jonathan Fred Quarles (to Eastman Kodak Co.).

Preparing dry adsorbent inorganic gels in spherical form from hydrogel spheres. No. 2,475,984. John J. Owen (to Standard Oil Development Co.).

Preparation of cobalt carbonyl by suspending a finely divided cobalt compound from the group consisting of cobalt carbonate, cobalt basic carbonate, and cobalt hydroxide in a neutral organic liquid which is a solvent for cobalt carbonyl and reacting with carbon monoxide. No. 2,476,263. Charles H. McKeever (to Rohm & Haas Co.).

Purification of red phosphorus in a process for production wherein yellow phosphorus is heated to convert a portion to red phosphorus, and yellow phosphorus is vaporized from the resulting mixture to leave a residue of red phosphorus, that improvement which comprises continuously mechanically separating a mud, consisting of solid red phosphorus in admixture with liquid yellow phosphorus, from a hot slurry of such resulting mixture. No. 2,476,335. John R. Tusson (to Tennessee Valley Authority).

Titanium slag concentrate the constituents of which are confined, with the exception of the possible addition of extraneous lime to those normally present in ores of titanium and iron and in the coal used to smelt said ores to produce a metallic iron product and the titanium slag concentrate capable of being separated from one another while in the molten state at a temperature of 1500° to 1700° C., said slag concentrate containing as the essential components iron oxide calculated as Fe, lime and titanium oxide, said slag concentrate being further characterized in that upon sulfuric acid digestion and leaching least 85% of the titanium is recoverable in the leach solution. No. 2,476,453. Willis M. Peirce, Robert K. Waring and Luther D. Fetterolf (to Quebec Iron and Titanium Corp.).

Preparing fluorescent alkaline earth metal fluorophosphate by preparing an aqueous solution of a water-soluble alkaline earth metal salt, adding a volatile water soluble inorganic fluoride which reacts with part of the said alkaline earth metal and forms an insoluble fluoride, adding an aqueous dispersion of compound of at least one activator metal of the group consisting of antimony, bismuth, tin and lead and mixtures of at least one said metal with manganese, adding a water soluble inorganic phosphate to precipitate a phosphate and bring down therewith the said insoluble alkaline earth metal fluoride and compound of said activator metal, drying and crushing to a fine powder, mixing with sufficient carbonate of said alkaline earth metal to give the corresponding orthophosphate upon ignition. No. 2,476,654. Herman C. Froelich (to General Electric Co.).

Cadmium phosphate phosphors activated with lead and fluorine as cadmium fluoride. No. 2,476,676. Alfred H. McKeag and Peter W. Ranby (to General Electric Co.).

Producing a catalyst for reaction of carbon monoxide and hydrogen by roasting and sintering an iron pyrite ore, adding an alkali metal compound promoting the synthesizing activity of iron catalysts and reducing with hydrogen. No. 2,476,920. Marnell A. Segura (to Standard Oil Development Co.).

Preparing alumina from clays and other silicates of aluminum by treatment with sulfuric acid. No. 2,476,979. Erwin C. Hoeman.

High efficiency blue-emitting, zinc cadmium sulfo-selenide phosphor. No. 2,477,070. Humboldt W. Leverenz (to Radio Corp. of America).

Preparing a silica-alumina catalyst which comprises mixing with an acid-stabilized silica sol an acid adsorptive-alumina. No. 2,477,373. James B. Hunter (to Atlantic Refining Co.).

Reducing ferric oxide to ferrosoferric oxide in a fluidized turbulent state. No. 2,477,454. Thomas D. Heath (to Dorr Co.).

In preparing cobalt carbonyl by suspending a finely divided cobalt compound from the group consisting of cobalt carbonate, cobalt basic carbonate, and cobalt hydroxide in a neutral organic liquid which is a solvent for cobalt carbonyl and reacting said cobalt compound with carbon monoxide the improvement which comprises having initially present in the reactor before any reaction takes place pre-formed cobalt carbonyl. No. 2,477,553. Charles H. McKeever (to Rohm & Haas Co.).

Preparation of cobalt carbonyl by dissolving a toluene-soluble cobalt salt of an organic acid, the organic radical of which salt is free of non-benzenoid unsaturation and contains only carbon, hydrogen, and oxygen atoms, in an inert organic liquid which also is free of non-benzenoid unsaturation and contains only carbon, hydrogen, and oxygen atoms, and reacting said dissolved cobalt salt with carbon monoxide. No. 2,477,554. Charles H. McKeever (to Rohm & Haas Co.).

Sodium diacetate stabilized with calcium sulphate and corn starch. No. 2,475,368. Hans F. Bauer and Elmer F. Glabe (to Stein, Hall & Co., Inc.).

Metals

Preparing amorphous solid selenium by heating selenium in excess of the melting point, passing gaseous ammonia through the molten selenium for reducing selenium dioxide, heating and degassifying the selenium in a vacuum, adding a small quantity of tungsten hexachloride to improve the conductivity of the selenium, and cooling. No. 2,474,966. Nicolaas Willem, Hendrik Addink and Maarten Hekelaar (to Hartford National Bank and Trust Co.).

Producing a supported platinum metal catalyst. No, 2,475,155. Edgar F. Rosenblatt (to Baker & Co., Inc.).

Beneficiating oxidized iron ores by froth flotation by subjecting the ore to froth flotation in the presence of an effective amount of a collector consisting essentially of a sulfonated aliphatic fatty acid selected from the group consisting of the aliphatic fatty-acids having at least 11 carbon atoms and mixtures of such acids. No. 2,475,581. Robert B. Booth and Earl C. Herkenhoff (to American Cyanamid Co.).

In reducing a comminuted inorganic oxygen containing zinc compound while in a fluidized state, the improvement which comprises recycling a portion of the zinc containing products emerging from the fluidized mass to promote fluidization. No. 2,475,607. Paul W. Garbo (to American Metal Co., Ltd.).

Acid copper plating solution consisting of copper sulfate, sulfuric acid, and an addition agent comprising triethanolamine. No. 2,475,974. Abraham M. Max (to Radio Corp. of America).

Blackening copper and its alloys in which the metal is immersed in a solution consisting of a water solution of a water soluble salt of an aryl sulphone monochloramide made alkaline with a strong water soluble fixed alkali. No. 2,475,981. Isaac Laird Newell (to Heatbath Corp.).

Production of a purified cobalt solution suitable for cobalt electro-winning from an impure cobalt salt solution by treating the solution with an excess of hydrogen sulfide. No. 2,476,284. Ruth E. Churchward and Francis K. Shelton.

Contacting phosphate material preheated to a temperature of at least 2500° F., with ferrophosphorus rich in silicon and thereby forming a silicate slag and ferrophosphorus of relatively low silicon content. No. 2,476,418. Bethune G. Klugh (to Monsanto Chemical Co.).

In recovering the major portion of cyanide soluble precious metal values from a cyanide pulp containing precious metal values, the steps of adding adsorbent char to effect adsorption of precious metal values and then completely separating the granular char from the pulp by screening. No. 2,476,420. Richard William Krebs.

Removing surface impurities including lead and bismuth compounds from polonium-plated metal with an aqueous solution containing ammonium hydroxide and ammonium persulfate. No. 2,476,823. Terrence A. O'Neil (to Firestone Tire & Rubber Co.).

Beneficiation of garnet ores by froth flotation in the presence of a collector containing compounds selected from the group consisting of sulfonated fatty acids, and sulfonated glyceride oils and an amount of an acid substance, the anion of which is capable of forming an acid having a dissociation constant greater than 10^{-7}. No. 2,477,402. Robert Ben Booth and Roy Alderson Pickens (to American Cyanamid Co.).

Precipitating a precious metal from a pregnant cyanide solution, which comprises subjecting zinc dust to treatment in a solution of a water soluble salt of copper and a water soluble salt of antimony and introducing the zinc dust so treated into the pregnant cyanide solution. No. 2,477,443. Dwight J. A. Dahlgren, Luther G. Hendrickson and Dinsmore Laurence Griffith (to Hudson Bay Mining & Smelting Co., Ltd.).

Arsenical gold ore treatment. No. 2,477,469. James V. Thompson (to Dorr Co.).

Organic

Preparing vinyl sulfones by subjecting material from the group consisting of beta-hydroxyethyl sulfones and alkanoic esters to heat decomposition. No. 2,474,808. Dwight L. Schoene (to U. S. Rubber Co.).

Quinoline compounds. No. 2,474,818. Joseph H. Burckhalter, Eldon M. Jones, Albert L. Rawlins, Frank H. Tendick and Walter F. Holcomb (to Parke, Davis & Co.).

Acridine compounds. No. 2,474,819. Joseph H. Burckhalter, Eldon M. Jones, Albert L. Rawlins, Frank H. Tendick and Walter F. Holcomb (to Parke, Davis & Co.).

Quinoline compounds. No. 2,474,820. Joseph H. Burckhalter, Eldon M. Jones, Albert L. Rawlins, Frank H. Tendick and Walter F. Holcomb (to Parke, Davis & Co.).

Quinoline compounds. No. 2,474,821. Joseph H. Burckhalter, Eldon M. Jones, Albert L. Rawlins, Frank H. Tendick and Walter F. Holcomb (to Parke, Davis & Co.).

Quinoline compounds. No. 2,474,822. Joseph H. Burckhalter, Eldon M. Jones, Albert L. Rawlins, Frank H. Tendick and Walter F. Holcomb (to Parke, Davis & Co.).

Quinoline compounds. No. 2,474,823. Joseph H. Burckhalter, Eldon M. Jones, Albert L. Rawlins, Frank H. Tendick and Walter F. Holcomb (to Parke, Davis & Co.).

Acridine compounds. No. 2,474,824. Joseph H. Burckhalter, Eldon M. Jones, Albert L. Rawlins, Frank H. Tendick and Walter F. Holcomb (to Parke, Davis & Co.).

Reacting a saturated aliphatic beta-lactone with thiourea and recovering the beta-isothiourea saturated aliphatic monocarboxylic acid thus formed. No. 2,474,838. Thomas L. Gresham and Forrest W. Shaver (to B. F. Goodrich Co.).

Beta-dithiocarbamyl carboxylic acid compounds. No. 2,474,839. Thomas L. Gresham and Jacob Eden Jansen (to B. F. Goodrich Co.).

Synthesizing organic disulfides by subjecting reactants containing different organo-thiyl groups selected from the group consisting of (a) mixture of organic disulfides, (b) a mixture of an organic disulfide and a mercaptan, and (c) an unsymmetrical organic disulfide—the organo-thiyl groups of said reactants being in combination different from that of the reaction products—to a redistribution of their organo-thiyl groups by reacting under the influence of light. No. 2,474,849. M. Kleiman (to Velsicol Corp.).

Mercury acetylide-silver complex, $HgC_2.3AgNO_3$. No. 2,474,869. Joseph A. Shaw and Elton Fisher (to Koppers Co., Inc.).

Refining ether by distilling a byproduct oil containing products such as ethyl ether, ether alcohol, acetaldehyde, ethyl acetate, olefins, diolefins, and other impurities to separate a fraction containing principally ethyl ether, Cs unsaturated hydrocarbons and aldehydes; passing the separated mixture through a nickel catalyst bed in contact with hydrogen to effect a hydrogenation of impurities therein; and fractionally distilling the hydrogenated mixture to separate ether. No. 2,474,874. Bernard J. C. van der Hoeven and Windy Ghoul (to Koppers Co., Inc.).

Phthalamidic acid compounds of pyridine and their salts. No. 2,474,893. Harris L. Friedman and Alexander V. Tolstoouhov (to Pyridium Corp.).

In production of the solid adduct of isobutylene and a material of the group consisting of nitrosyl chloride and nitrosyl bromide, the improvement which comprises carrying out the reaction in the presence of activated carbon. No. 2,474,901. Andrew J. Martin (to Allied Chemical & Dye Corp.).

In production of the solid adduct of isobutylene and a material of the group consisting of nitrosyl chloride and nitrosyl bromide, the improvement which comprises carrying out the reaction in the presence of activated bauxite. No. 2,474,902. Andrew J. Martin (to Allied Chemical & Dye Corp.).

In production of the solid adduct of isobutylene and a material of the group consisting of nitrosyl chloride and nitrosyl bromide, the improvement which comprises carrying out the reaction in the presence of activated clay. No. 2,474,903. Andrew J. Martin (to Allied Chemical & Dye Corp.).

Quinoline compounds. No. 2,474,931. Joseph H. Burckhalter, Eldon M. Jones, Albert L. Rawlins, Frank H. Tendick and Walter F. Holcomb (to Parke, Davis & Co.).

Making a water soluble, monomeric N-(2-hydroxyalkyl)1,2-alkylenimine by reacting a non-acidic mixture of a water-soluble, lower alkylenimine in which the nitrogen atom is attached to adjacent carbon atoms and a water-soluble lower alkylene oxide. No. 2,475,068. Alexander L. Wilson (to Carbide and Carbon Chemicals Corp.).

N'-p-iodophenyl-N²-methyl-N⁵-isopropyl biguanide. No. 2,475,081. Francis Henry Swinden Curd, Dora Nellie Richardson and Francis Leslie Rose (to Imperial Chemical Industries Ltd.).

Multistage conversion of hydrocarbons to acetylene by regenerative cracking. No. 2,475,093. R. L. Hasche (to Tennessee Eastman Corp.).

Cuprous salt inhibitors for furfural copolymerization. No. 2,475,094. John C. Hillyer and Daniel A. Nicewander (to Phillips Petroleum Co.).

Continuous process for the nitration of toluene to trinitrotoluene. No. 2,475,095. Theodorus J. J. Hoek (to De Directie van de Staatsmijnen in Limburg).

2,5-dimethoxy-2,5-dihydrosylvan. No. 2,475,097. David Gwyn Jones (to Imperial Chemical Industries Ltd.).

Condensing β-ionone with the Grignard of 3-hydroxy-3-methyl-hexene-1-yne-5 to yield the Grignard of 3,7-dihydroxy-3,7-dimethyl-9-[2',6',6'-trimethyl-cyclohexene-(1')-yl]-nonadiene-1,8-yne-5. No. 2,475,139. Otto Isler and Albert Businger (to Hoffmann-La Roche, Inc.).

Phosphoric acid ester of hydrogenated sulfurized cardanol. No. 2,475,143. Leobeus C. Kemp, Jr. (to Texas Co.).

Method for recovering wheat starch from aqueous wheat starch slurries containing appreciable amounts of soluble protein, which comprises ageing said slurry decanting the supernatant liquid, washing the settled starch and filtering. No. 2,475,261. Richard L. Slotter and Justin M. Tuomy (to U. S. A. as represented by the Secretary of Agriculture).

Coupling tetrazotized 3:3'-dihydroxy-4:4'-diaminodiphenyl with 2:6-dihydroxynaphthalene in the presence of an ethanolamine. No. 2,475,265. Willy Widmer and Hans Mayer (to Ciba Ltd.).

Producing acetylene black by subjecting a hydrocarbon gas containing methane to its dissociation temperature in a furnace to produce a mixed gas containing acetylene; passing said mixed gas from said furnace to a chamber at the same temperature to dissociate the acetylene into acetylene black and a second mixed gas containing a substantial proportion of hydrogen; introducing a heat-absorbing gas during dissociation, said heat-absorbing gas being introduced in a quantity sufficient to absorb the heat of dissociation released but insufficient to cool the mixed gas; and removing the acetylene black. No. 2,475,282. Rudolph Leonard Hasche (to Tennessee Eastman Corp.).

Treating the water-soluble organic compounds for removing heavy metal ions of the group consisting of lead, copper and bismuth; by dissolving in water the organic compound to be treated, making the pH value about 2.0 to 9.5, adding a compound of the group consisting of thioglycolic acid and its alkali metal salts, heating, clarifying, and then salting out the water-soluble organic compound. No. 2,475,350. Boyce G. Carson (to E. I. du Pont de Nemours & Co.).

Producing light-colored commercial stearic acid by distilling the normally solid fatty acid fraction obtained by hydrolyzing a natural fat containing stearic acid, and removing potential color-forming bodies by treating the distillate with an adsorbent material. No. 2,475,420. Alexander C. Brown and Victor J. Muckerheide (to Emery Industries, Inc.).

Preparation of 3,6-diamino-1,4-dihydro-1,2,4,5-tetrazine by reacting an alkyl carbonate with a compound taken from the group consisting of hydrazine and hydrazine hydrate. No. 2,475,440. Henry A. Walter (to Monsanto Chemical Co.).

Preparing an unsubstituted benzanthrone acridine dianthrimide acridone by reacting an unsubstituted bzl-benzanthronyl alpha amino dianthrimide acridone with an alkaline condensing agent at an elevated temperature. No. 2,475,521. Mario Scalera and Asa W. Joyce (to American Cyanamid Co.).

Nuclear acylation of a phenyl alkyl ether comprising reacting the same with an acylating agent selected from the group consisting of acyl halides and anhydrides of carboxylic acids in the presence of an acid selected from the group consisting of sulfuric acid and the strong hydroxy acids of phosphorus. No. 2,475,564. Howard D. Hartough and Alvin I. Kosak (to Socony-Vacuum Oil Co., Inc.).

Acylating a phenyl alkyl ether by reacting with an acylating agent selected from the group consisting of acyl halides of carboxylic acids and anhydrides of carboxylic acids in the presence of a porous absorptive catalyst selected from composites consisting essentially of silica and alumina and composites consisting essentially of silica and zirconia. No. 2,475,567. Alvin I. Kosak and Howard D. Hartough (to Socony-Vacuum Oil Co., Inc.).

Production of the lactam of 2-methyl-3-amino-4-carboxy-5-aminomethyl pyridine by mixing an acid salt of 2-methyl-3-amino-4-carbethoxy-5-aminomethyl pyridine with an aqueous solution of a base. No. 2,475,569. John Halley Mowat (to American Cyanamid Co.).

Preparing 2-carbomethoxy-methyl-3-carbomethoxy-4-keto thiophane by heating methyl thioglycolate with methyl glutaconate in the presence of sodium methoxide and a suitable solvent. No. 2,475,580. Bernard R. Baker (to American Cyanamid Co.).

Producing predominantly lower oxidation products from hydrocarbons by passing through an elongated passage concurrent streams of a gas containing free oxygen and a liquid hydrocarbon rich in unsaturates. No. 2,475,605. Carl F. Prutton, Clark O. Miller, Willis G. Craig (to Lubrizol Corp.).

Monomeric 1,3,5-trioxepane. No. 2,475,610. William F. Gresham and Clarence D. Bell (to E. I. du Pont de Nemours & Co.).

Para-aminobenzenesulfonamidohalopyrazines and salts thereof. No. 2,475,673. Elmore H. Northey and John S. Webb (to American Cyanamid Co.).

Preparing dicyandiamide hydrochloride by reacting dicyandiamide with hydrochloric acid in a slurry suspended in a non-aqueous medium. No. 2,475,674. Joseph H. Paden and Alexander F. MacLean (to American Cyanamid Co.).

Quaternizing pyridine compounds. No. 2,475,689. Franz Bergel, Aaron Cohen, John Wynne Haworth, Edward Graham Hughes and John Arthur Silk (to Hoffmann-La Roche, Inc.).

Preparing melamine by heating at least one of the substances of the group consisting of melam, melen and melon with anhydrous ammonia. No. 2,475,709. Johnstone S. Mackay and Joseph H. Paden (to American Cyanamid Co.).

Hydrogenation of naphthalene compounds by subjecting such compounds

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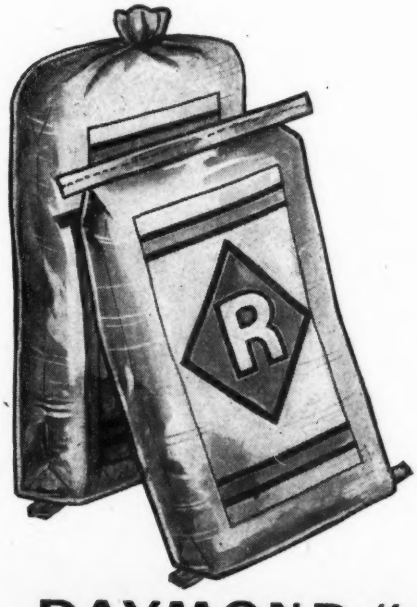

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to the action of an aqueous alkali solution in the presence of an alloy of a metal capable of reacting with the alkali solution to yield hydrogen and a catalytic metal which is relatively inert toward the alkali solution. No. 2,475,718. Domenick Papa and Erwin Schwenk (to Schering Corp.).

Pyridine derivatives, derived from β-ionone. No. 2,475,729. David Adriaan van Dorp and Josef Ferdinand Arens (to N. V. Organon).

Producing reactive halogen containing organic compounds by dehalogenating substantially fully saturated halogenation addition products of the aldehydes of the monoheteroatomic five membered rings to a point where the average halogen content of the resultant partial dehalogenation product is equal to not less than one atom of halogen per molecule of aldehyde. No. 2,475,801. Emil E. Novotny and George Karl Vogelsang (to Borden Co.).

Morpholinoalkanol esters. No. 2,475,852. Elmore Hathaway Northey and Martin Everett Hultquist (to American Cyanamid Co.).

2-Acylamino-5-thiazolylphenyl sulfide. No. 2,475,872. Louis L. Bambas (to Parke, Davis & Co.).

An alkylsubstituted phenyl stearic acid, said alkyl substituent having at least 20 carbon atoms. No. 2,475,916. Orland M. Reiff, Ferdinand P. Otto, John J. Giammaria and Edward A. Oberright (to Socony-Vacuum Oil Co., Inc.).

N-allyl-2-pyridone-5-carboxylic acid. No. 2,475,929. Lewis A. Walter (to Maltbie Chemical Co.).

7-Hydroxy-8-N-piperidinomethylisoquinoline. No. 2,475,932. Robert B. Woodward and William von Eggers Doering (to Polaroid Corp.).

1-Alkyl-2-iminonaphtho [1,2] selenazoline compounds. No. 2,475,949. Homer W. J. Cressman (to Eastman Kodak Co.).

Concentrating a dilute aqueous solution of formaldehyde by azeotropic distillation with methyl isobutyl ketone. No. 2,475,959. Rudolph Leonard Hasche and Joseph H. Brant (to Eastman Kodak Co.).

Producing an acyl halide by reacting an unsaturated monocarboxylic ester with a hydrogen halide. No. 2,475,966. David C. Hull (to Eastman Kodak Co.).

Oxidation to a pyridine carboxylic acid of an N-heteroaryl compound containing a pyridine nucleus and having an oxidizable organic grouping attached to the nitrogen containing aromatic nucleus, which comprises introducing a mixture of reactants including the N-heteroaryl compound, sulfuric acid with nitric acid and reacting. No. 2,475,969. Millard Samuel Larrison (to Allied Chemical & Dye Corp.).

Production of naphthalene from a petroleum naphtha feed stock. No. 2,475,977. Herbert H. Meier (to Standard Oil Development Co.).

Separating iso-octane from normal heptane in a liquid mixture by passing the liquid mixture into contact with an interior wall of a vulcanized rubber tube acting as a diaphragm and vaporizing diffused normal heptane from an outerside of said tube, and condensing the thus vaporized normal heptane. No. 2,475,990. Anthony E. Robertson (to Standard Oil Development Co.).

Producing butadiene by heating a mixture of butylenes to 1100°-1300° F., heating a diluent, contacting the heated diluent with a bed of solid absorbent material to remove iron, its compounds, and other foreign materials, forming a mixture of the contacted diluent with the heated butylenes, passing the mixture through a bed of a dehydrogenation catalyst and recovering a product including butadiene. No. 2,475,993. Wilson D. Seyfried (to Standard Oil Development Co.).

Mixing acrolein with 2-nitropropane in the presence of an alkaline condensation catalyst. No. 2,475,996. Curtis W. Smith (to Shell Development Co.).

Oxidation to a pyridine carboxylic acid of an N-heteroaryl compound containing a pyridine nucleus and having an oxidizable organic grouping attached to the nitrogen-containing aromatic nucleus by subjecting a mixture of said N-heteroaryl compound sulfuric acid and a substance selected from the group consisting of halogens, hydrogen halides, and halogen-containing compounds which react with sulfuric acid at 50° C. to yield a substance selected from the group consisting of free halogens and hydrogen halides to oxidize the N-heteroaryl compound. No. 2,476,004. Wilber Otis Teeters (to Allied Chemical & Dye Corp.).

2-Cyano-2,3-diacetoxy butanes. No. 2,476,026. Albert M. Clifford and John R. Long (to Wingfoot Corp.).

Wax-substituted diaryl dithiophosphoric acids and salts thereof. No. 2,476,037. John J. Giammaria (to Socony-Vacuum Oil Co., Inc.).

Process for making an ester by mixing together and heating in the presence of a neutral to basic ester-exchange catalyst, an alcohol and an ester of a different and relatively more volatile alcohol. No. 2,476,052. Samuel B. Lippincott (to Standard Oil Development Co.).

Process for selective esterification of secondary hydroxyl groups in an aliphatic glycol containing both secondary and tertiary hydroxyl groups linked to aliphatic carbon atoms by mixing together and heating in the presence of a neutral to basic ester-exchange catalyst the said glycol and an ester of a secondary aliphatic alcohol different from and more volatile than said glycol. No. 2,476,053. Samuel B. Lippincott (to Standard Oil Development Co.).

In the production of citric acid by submerged oxidative fermentation of assimilable carbohydrate-containing media with a citric acid producing strain of A.niger, the improvement which comprises incorporating ammonium carbonate and morpholine in the media. No. 2,476,159. Leonard B Schweiger and Raymond L. Snell (to Miles Labs., Inc.).

Alpha, alpha'-trithiocarbonodialiphatic acids. No. 2,476,165. Stephen J. Wayo (to Sinclair Refining Co.).

Alpha, alpha-dithiocarbonodialiphatic acids. No. 2,476,166. Stephen J. Wayo (to Sinclair Refining Co.).

In making diphenylamine wherein chlorobenzene, aniline, and sodium hydroxide are heated together, the method of accelerating the reaction which comprises adding to the reaction mixture a small proportion of an ionizable inorganic potassium compound. No. 2,476,170. Alexander H. Widiger, Jr. (to Dow Chemical Co.).

Refining of crude methanol by azeotropic distillation with a normally liquid non-aromatic hydrocarbon having from 5 to 8 carbon atoms per molecule and a second liquid selected from the group consisting of the aromatic hydrocarbons benzene toluene and xylene, and of halogenated hydrocarbons selected from the group consisting of amyl chloride, 1,2-dichloro-n-butane, chloroform and carbon tetrachloride. No. 2,476,205. James F. McCants (to Skelly Oil Co.).

Purification of methanol by azeotropic distillation with a saturated alicyclic hydrocarbon having from 5 to 8 carbon atoms per molecule an aromatic hydrocarbon selected from the group consisting of benzene, toluene and xylene. No. 2,476,206. James F. McCants (to Skelly Oil Co.).

Reaction product of styrene oxide. No. 2,476,252. Charles A. Thomas and Carroll A. Hochwalt (to Monsanto Chemical Co.).

Araliphatic nitriles. No. 2,476,264. Warren D. Niederhauser (to Rohm & Haas Co.).

Pyrolyzing 1-acetoxy-1,1-dicyano ethane and separating 1,1-dicyano ethylene. No. 2,476,270. Alan E. Ardis (to B. F. Goodrich Co.).

Hydrolyzable, water-soluble ester of an alkyl trihydroxy-silane, said ester being characterized by surface-active properties and being obtainable by reacting a silicon compound of the formula R—Si—$(OC_2H_5)_3$, wherein R is an alkyl radical of at least 12 carbon atoms, with a polyethylene glycol having the unit $OCH_2.CH_2$ repeated in a chain from 2 to 12 times. No. 2,476,307. David Xavier Klein and Donovan Erb Kvalnes (to E. I. du Pont de Nemours & Co.).

Obtaining 1-(+)-N-[4-([(2-amino-4-hydroxy-6-pteridyl)-methyl] amino)-benzoyl] glutamic acid. No. 2,476,360. Leonard Doub and Louis L. Bambas (to Parke, Davis & Co.).

In separation of propionaldehyde from a mixture comprising propionaldehyde and acrolein, the step which comprises subjecting the mixture to fractional distillation under reflux while introducing furfural into the vapor stream. No. 2,476,391. Adin Lee Stautzenberger and Samuel B. Jeffries (to Celanese Corp. of America).

Manufacture of 5,6-unsaturated-7-halogeno-steroids and 5,6-unsaturated-7-dehydrosteroids. No. 2,476,424. Albert Lowenbein.

Methyl ester of α-phenylacetamido-β-benzoyloxyacrylic acid. No. 2,476,443. Stanton A. Harris, Carl H. Hoffman and Karl Folkers (to Merck & Co., Inc.).

In preparing ammelide, the steps which consist in reacting a member of the group consisting of cyanamide and dicyandiamide with carbon dioxide in the absence of ammonia. No. 2,476,452. Joseph H. Paden and Alexander F. MacLean (to American Cyanamid Co.).

3-Cyano-4-alkoxymethyl-5-acylamino-methyl-6-methyl-pyridone-2. No. 2,476,464. Eric T. Stiller (to Merck & Co., Inc.).

In the recovery of ethylene in gaseous mixtures, the steps of bringing the gaseous mixture into contact with active carbon in a vessel throughout which the said active carbon moves unimpaired in a fluidized particulate state. No. 2,476,472. Michael H. M. Arnold and Donald Baxter (to Imperial Chemical Industries Ltd.).

Production of trifluoroacetic acid from m-aminobenzotrifluoride by reacting m-aminobenzotrifluoride with a salt of permanganic acid while dissolved in a liquid mixture comprising water and an acid selected from the group consisting of acetic acid and trifluoroacetic acid. No. 2,476,490. Walter Norman Haworth and Maurice Stacey.

Reacting an unsubstituted saturated aliphatic nitrile, water, and an amine selected from the group consisting of unsubstituted aliphatic primary amines and unsubstituted aliphatic secondary amines, in contact with a catalyst consisting of a synthetic precipitated silica gel subsequently promoted by a minor proportion of adsorbed hydrolytic alumina. No. 2,476,500. John E. Mahan (to Phillips Petroleum Co.).

Preparing an ester of an α-haloacrylic acid by dehydrohalogenating an ester of a dihalopropionic acid having at least one halogen atom in the α-position, in the presence of a salt selected from the group consisting of ammonium, alkali metal and alkaline earth metal salts of an organic carboxylic acid. No. 2,476,528. Carl E. Barnes (to General Aniline & Film Corp.).

Organohalosilanes. No. 2,476,529. Arthur J. Barry (to Dow Chemical Co.).

Chlorotriazinylnitriles. No. 2,476,546. Ingenuin Hechenbleikner (to American Cyanamid Co.).

Chlorotriazinylnitriles. No. 2,476,547. Ingenuin Hechenbleikner (to American Cyanamid Co.).

Triazinylnitriles. No. 2,476,548. Ingenuin Hechenbleikner (to American Cyanamid Co.).

2-[Vinyl-dicarboxylic acid ester]-3-amino-1,2,4-triazoles. No. 2,476,549. N. Heimbach and W. Kelly, Jr. (to General Aniline & Film Corp.).

Inhibiting discoloration and deterioration of non-acidic organic oxygen compounds during chlorination in the presence of iron which comprises adding to the chlorination mixture an amine. No. 2,476,554. Bert H. Lincoln and Clarence A. Neilson (to Continental Oil Co.).

Oxazine diones. No. 2,476,559. Paul Nawiasky, Leslie Millard Schenck and Isaac Glenn Stevenson (to General Aniline & Film Corp.).

Preparing a chloroformate by adding an alcohol to a liquid chloroformate solution of phosgene, permitting vaporization of phosgene. No. 2,476,637. Franklin Strain and Wilbert F. Newton (to Pittsburgh Plate Glass Co.).

Manufacture of sulfone amides of the general formula $R.SO_2.NHX$ wherein R represents a phenyl radical to which the group—$SO_2.NHX$ is attached, X being a member of the class consisting of unsaturated heterocyclic radicals containing two nitrogen atoms in the ring and acyl radicals of carboxylic acids. No. 2,476,655. Hermann Fox, Paul Diedrich and Max Dohrn (to Shering Corp.).

Producing gamma-lactones by heating an ethyl ester of a gamma-bromo aliphatic acid and evolving ethyl bromide therefrom. No. 2,476,668. Morris S. Kharasch and Elbert C. Ladd (to United States Rubber Co.).

Production of thiazoles and selenazoles with fused-on rings. No. 2,476,669. Edward B. Knott (to Eastman Kodak Co.).

In preparing p,p-dihydroxy-3,4-diphenylhexane from p,p'-dimethoxy-3,4-diphenylhexene in a form obtainable by dehydration of p,p'-dimethoxy-3,4-diphenyl-n-hexane-3(4)-ol, the steps of subjecting the said p,p'-dimethoxy-3,4-diphenylhexene to hydrogenation in the presence of Raney nickel and of ethyl acetate as solvent and then subjecting the product of said hydrogenation to demethylation. No. 2,476,679. Henri Morren.

In a liquid phase process for the preparation of vinyl cyanide by reacting acetylene and hydrogen cyanide in an acidic aqueous solution of cuprous chloride containing a solubilizer of the class consisting of ammonium chloride, alkali metal chlorides, and amine hydrochlorides wherein the cuprous chloride solution contains an oxide of an element of the class consisting of arsenic and bismuth. No. 2,476,771. Paul Lawrence Salzberg (to E. I. du Pont de Nemours & Co.).

Aromatic isocyanate in which at least one isocyanate radical is attached to the aromatic ring of the group consisting of the unsubstituted and substituted carbocyclic aromatic isocyanates in the latter of which the only substituents other than hydrocarbon radicals and isocyanate radicals are from the group consisting of hydrocarbonoxy radicals and halogen atoms, having admixed therewith a small amount of a compound selected from the group consisting of phosphorus trichloride, phosphorus pentachloride, and phosphorus oxychloride. No. 2,476,779. Bernard Miller Sturgis (to E. I. du Pont de Nemours & Co.).

Preparation of a pyrimidino (4,5-b) pyrazine by condensing a 4,5-diaminopyrimidine compound with a dialkoxy acetate selected from the group consisting of alkali metal, alkaline earth metal and alkyl dialkoxy acetates in the presence of sulfuric acid. No. 2,476,809. William F. Bruce and William J. McDermott (to Wyeth Inc.).

1-Alkoxy-2,4-dinitro-6-tertiary-butyl-benzenes. No. 2,476,815. Marion Scott Carpenter and William M. Easter, Jr. (to Givaudan Corp.).

Preparing succinic anhydride and acetone which comprises reacting diketene with succinic acid. No. 2,476,859. Hugh J. Hagemeyer, Jr. (to Eastman Kodak Co.).

Preparing enol esters of enolizable organic compounds. No. 2,476,860. Hugh J. Hagemeyer, Jr. (to Eastman Kodak Co.).

Ester of a polyhydric alcohol having all of the hydroxyl groups thereof esterified by a mixture of acids, one of which is a mercaptocarboxylic acid, the remaining acids being those of a drying oil. No. 2,476,891. Carl Walter Mortenson (to E. I. du Pont de Nemours & Co.).

1-Alkyl-4-(N-benzyl-N-beta-dialkyl-aminoethylamino)-piperidines. No. 2,476,912. Robert H. Reitsema (to Upjohn Co.).

1-Alkyl-4-(beta-hydroxyethyl-amino)-piperidine benzoates. No. 2,476,913. Robert H. Reitsema (to Upjohn Co.).

1-Alkyl-4-(N-benzyl-N-beta-pyrrolidinoethylamino)-piperidines. No. 2,476,914. Robert H. Reitsema (to Upjohn Co.).

2-Sulfanilamido-4-thiazolone in which the thiazolonly radical is alkyl-substituted in the 5-position. No. 2,476,944. Maurice L. Moore and James M. Sprague (to Sharp & Dohme, Inc.).

N^4-carboxyacylsulfanilylsulfanilamides. No. 2,476,945. Maurice L. Moore (to Sharp & Dohme, Inc.).

Acid halides of 5-acyloxypyrazoles. No. 2,476,986. Elmore Louis Martin (to E. I. du Pont de Nemours & Co.).

5-Acyloxypyrazoles which are unsubstituted in the 4-position and contain an amidoaldehyde group in at least one of the positions 1 and 3 in the pyrazole ring and their acetals with alkanols of 1 to 4 carbon atoms and 1,2-and 1,3-dihydroxyalkanes of 2 to 4 carbon atoms, and are free from amide-aldehyde reactive groups. No. 2,476,987. Elmore Louis Martin (to E. I. du Pont de Nemours & Co.).

5-Acyloxypyrazole amidoacetals. No. 2,476,988. Elmore Louis Martin (to E. I. du Pont de Nemours & Co.).

Solvation and depolymerization of solid carbonizable fuel for the production of extracts which comprises treating said fuel with a liquid dicyclic hydroaromatic compound containing at least one phenolic hydroxyl group in an atmosphere rich in hydrogen. No. 2,476,999. Milton Orchin (to U. S. A. by Secretary of Interior).

9-Halogeno-1:2:3':2'-pyridoacridines, bearing in the 3 and 6-positions substituents selected from the group consisting of hydrogen, halogen and methyl. No. 2,477,048. James Dobson, William Chalmers Hutchison and William Ogilvy Kermack (to Imperial Chemical Industries Ltd.).

Pyridoacridines. No. 2,477,049. James Dobson, William Chalmers Hutchison and William Ogilvy Kermack (to Imperial Chemical Industries Ltd.).

Separation and purification of methyl ethyl ketone from a mixture comprising methyl ethyl ketone, tetrahydrofuran, 2-methyl tetrahydrofuran, formals, acetals and oxides, by fractionating the mixture to separate a fraction boiling from about 68 to 75° C., mixing said fraction with hexane, distilling and separating a mixture of hexane and methyl ethyl ketone-washing the distillate with water to extract the methyl ethyl ketone, subjecting the aqueous extract to a water extractive distillation to wash the acetals therefrom and to distill off an azeotrope consisting of methyl ethyl ketone and water, extracting the azeotrope with pentane whereby the methyl ethyl ketone is removed and stripping the pentane from the methyl ethyl ketone to yield purified methyl ethyl ketone. No. 2,477,087. Nat C. Robertson (to Celanese Corporation of America).

Alkylation of phenols by contacting a phenolic compound with an alkylating agent at an alkylating temperature in the presence of a carboxylic acid alkylation catalyst. No. 2,477,091. Robert H. Rosenwald (to Universal Oil Products Co.).

A 2-lower alkyl-5,5-dimethyl-Δ^2-4-thiazole carboxylic acid. No. 2,477,148. John C. Sheehan, Ralph Mozingo, Karl Folkers and Max Tishler (to Merck & Co., Inc.).

Preparing a hydrohalic acid salt of penicillamine, by heating α-amino-β-benzylmercapto-isovaleric acid with an aqueous solution of a hydrohalic acid. No. 2,477,149. John C. Sheehan and Max Tishler (to Merck & Co., Inc.).

Preparation of veratraldehyde, comprising reacting opianic acid with aniline to form an opianic acid anil, decarboxylating said anil and hydrolyzing the decarboxylated product. No. 2,477,158. John Weijlard and Max Tishler (to Merck & Co., Inc.).

Manufacture of beta dinitro compounds. No. 2,477,162. Carl T. Bahner and Harvey T. Kite.

A pulverulent water-soluble stabilized diazo compound which is a salt admixed with an amount of at least 5 carbon atom liquid dialkyl carbonate. No. 2,477,165. Herman A. Bergstrom (to General Aniline & Film Corp.).

Naphthenic acid production. No. 2,477,190. Hooper Linford and William J. Baral (to Union Oil Co. of California).

o-Allylphenyl acrylate. No. 2,477,293. Edward M. Filachione and Charles H. Fisher (to U. S. A. by Secretary of Agriculture).

Converting an aliphatic ether to an aldehyde which comprises contacting a mixture of an aliphatic ether and steam with an active dehydrogenating catalyst. No. 2,477,312. Paul T. Parker (to Standard Oil Development Co.).

Hydroxy alkyl thio succinic acids and esters. No. 2,477,327. Edward S. Blake (to Monsanto Chemical Co.).

Removal of hydrogen halide from organo-substituted polysiloxanes. No. 2,477,330. Charles D. Doyle (to General Electric Co.).

Aryloxyalkenes. No. 2,477,342. Earl T. McBee and Robert O. Bolt (to Purdue Research Foundation).

Methylol compound of the general formula, R—CONH—CH_2OH, wherein R designates an aliphatic radical selected from the group consisting of heneicosyl and docosoxy. No. 2,477,346. Josef Pikl (to E. I. du Pont de Nemours & Co.).

Producing a tertiary alcohol by contacting an iso-olefin hydrocarbon and water with an organic hydrogen ion exchange hydration catalyst under hydrating conditions. No. 2,477,380. Saul I. Kreps and Frederick C. Nachod (to Atlantic Refining Co.).

Preparing 2-chloropyrimidines by mixing the corresponding 2-aminopyrimidine with an excess of alkali metal nitrite in the presence of concentrated hydrochloric acid. No. 2,477,409. Kenneth L. Howard (to American Cyanamid Co.).

Preparing 2-amino-4-hydroxy-6-methylpyrimido[4,5-b]pyrazine by reacting 2,4,5-triamino-6-hydroxypyrimidine with methyl glyoxal in aqueous solvent in the presence of the SO_3-ion. No. 2,477,426. Joseph Semb (to American Cyanamid Co.).

In the production of olefine oxides, the steps comprising passing a mixture of an olefine and free oxygen containing gas over a solid porous catalyst prepared by impregnating a porous carrier with an aqueous solution of a silver salt of an organic acid in the presence of an oxidizing agent whose decomposition products are volatile below 300° C., removing surplus liquid and drying the impregnated carrier, thereafter decomposing the said deposited silver salt by heating in the presence of an inert gas for several hours. No. 2,477,435. Robert S. Aries.

In making tetraethyl lead by the reaction of **ethyl chloride on load monosodium alloy,** the improvement which comprises carrying out the reaction in the presence of an acetal of the class which consists of acetals consisting of carbon, hydrogen and two oxygen atoms and corresponding monochlorine and dichlorine substituted acetals. No. 2,477,465. Roy Joseph Plunkett (to E. I. du Pont de Nemours & Co.).

5,6-dimethoxy-8-substituted quinolines. No. 2,477,479. Robert C. Elderfield and James D. Head (to U. S. A. by Secretary of War).

6-methoxy-8-substituted quinolines. No. 2,477,480. Robert C. Elderfield and James D. Head (to U. S. A. by Secretary of War).

Compound selected from the group consisting of the para-nitrobenzyl ethers of tyrosine and of N-acetyltyrosine, and the alkali metal, alkaline earth metal and ammonium salts of these ethers. No. 2,477,537. Souren Avakian and Gustav J. Martin (to National Drug Co.).

Di-isopropylidenediglycerol. No. 2,477,550. Harold Wittcoff (to General Mills, Inc.).

Catalytic hydrolysis of unsaturated organic halides in an acidic aqueous solution of a cuprous halide. No. 2,475,364. Gerald H. van de Griendt and Leslie M. Peters (to Shell Development Co.).

N-2-ethyl hexyl α,α'-di-keto β,β'-(1,4-Δ^2-cyclopentenylene)-pyrrolidine by refluxing 1,4-cyclopentenylene succinic acid anhydride and of 2-ethyl hexylamine in dry toluene. No. 2,476,512. Albert A. Schreiber (to Van Dyk & Co., Inc.).

Paper & Pulp

Thin, porous, light-weight, finished tissue paper comprising unbeaten, synthetic, artificially formed, extruded fibers. No. 2,477,000. Fay H. Osborne (to C. H. Dexter & Sons, Inc.).

Petroleum

Hydrocarbon conversion with steam-treated kaolin. No. 2,474,868. Hubert A. Shabaker (to Houdry Process Corp.).

Synthesizing normally liquid hydrocarbons by reacting carbon monoxide and hydrogen in the presence of a powdered catalyst. No. 2,475,214. Frank T. Barr (to Standard Oil Development Co.).

Lubricant consisting of a mineral lubricating oil and an oil soluble polymer of a monomeric material having the general formula $CH_2CXCOSR$ in which X is a radical selected from the class consisting of hydrogen and a lower alkyl group and R is an alkyl group having a carbon content in the range of 5 carbon atoms to the atomic carbon content of paraffin wax. No. 2,475,246. Louis A. Mikeska (to Standard Oil Development Co.).

Isomerizing paraffin wax by dissolving paraffin wax in an cycloparaffinic hydrocarbon solvent and contacting with a preformed hydrocarbon-aluminum chloride complex. No. 2,475,358. Robert J. Moore and Bernard S. Greensfelder (to Shell Development Co.).

Water clay base drilling fluid for use in oil and gas well drilling, consisting of water, clay and a water-soluble alkali metal rosin soap and petroleum oil in an amount sufficient to inhibit substantial foaming of the resulting drilling fluid. No. 2,475,485. Milton Dyke and Edward Samuel Self (to Oil Well Chemical and Materials Co., Inc.).

Mechanically stable, thermally reversible non-bleeding lithium soap grease comprising a mineral lubricating oil, a lithium soap of a mixture comprising from about 10% to about 90% of 12-hydroxy stearic acid and from 90% to about 10% of a hydrogenated fish oil fatty acid, and a polyalkylene glycol. No. 2,475,589. Arnold A. Bondi (to Shell Development Co.).

Liquid lubricating oil composition comprising a mineral lubricating oil and an anhydrous, non-hygroscopic mixture of sperm oil alcohols and the calcium salts of sperm oil fatty acids, the fatty acids in the form of their calcium salts and the sperm oil alcohols existing in substantially the same relative proportions as the corresponding alcohols and acids exist in the unsaponified sperm oil to confer improved detergent, anti-oxidant and oiliness properties. No. 2,475,727. Herschel G. Smith and Troy L. Cantrell (to Gulf Oil Corp.).

Recovery of naththene hydrocarbons. No. 2,475,828. Adalbert Farkas and Arthur F. Stribley, Jr. (to Union Oil Co. of Calif.).

Lubricating oil composition consisting of waxy mineral lubricating oil containing a pour depressing amount of a Friedel-Crafts condensation product of from 5 to 10 mols of diisobutylene and 1 mol of an initial Friedel-Crafts condensate obtained by condensing a chlorinated paraffin wax and naphthalene. No. 2,475,970. Eugene Lieber and Raymond M. Dean (to Standard Oil Development Co.).

Pyrolytic conversion of hydrocarbons with the aid of a fluidized catalyst. No. 2,476,143. Willis S. Gullette (to Sinclair Refining Co.).

Pyrolytic conversion of hydrocarbons with the aid of a fluidized catalyst. No. 2,476,144. Willis S. Gullette (to Sinclair Refining Co.).

Isomerization of paraffin hydrocarbons by contact with catalyst conprising aluminum chloride and ferric chloride. No. 2,476,416. Vladimir N. Ipatieff and Herman Pines (to Universal Oil Products Co.).

Decolorizing petrolatum stock, by contacting said stock with air and thereafter contacting the oxidized stock with a decolorizing adsorbent at a temperature such that the oxidizing stock is in a fluid state. No. 2,476,417. William McPheeters Jarnagin (to Attapulgus Clay Co.).

Catalytic conversion of a hydrocarbon oil containing as a minor portion constituent capable of forming coke upon complete vaporiaztion which comprises preheating said oil to a temperature such that all of the non-coke forming but none of the coke forming constituents are vaporized, admixing with an oxygen-containing gas, contacting the resultant mixture with a bed of inert, non-catalytic, granular heat resistant material and effecting combustion of said hydrocarbon oil to elevate the temperature to effect complete vaporization of said hydrocarbon including said coke-forming constituents, and then contacting the completely vaporized mixture with a contiguous bed of cracking catalyst to crack said hydrocarbons. No. 2,476,729. Carl J. Helmers (to Phillips Petroleum Co.).

Improved paraffin alkylation process which comprises reacting an alkylatable paraffin and an olefin in a first zone in the presence of an alkylation catalyst; reacting a resulting effluent with an alkylatable cyclic organic compound in a second alkylation zone; reacting a resulting reaction mixture effluent with an olefin in a third alkylation zone, and removing a hydrocarbon fraction boiling within the motor fuel boiling range as a product. No. 2,476,750. Maryan P. Matuszak (to Phillips Petroleum Co.).

Recovery of hydrocarbon synthesis products. No. 2,476,788. Philip C. White (to Standard Oil Co.).

Composition for addition to lubricating oil comprising an oil-soluble alkaline earth metal salt of the reaction product obtained by phosphosulfurizing a hydrocarbon lubricating oil fraction from which the most highly aromatic and the most highly paraffinic components have been removed. No. 2,476,812. John P. Buckmann and Loren L. Neff (to Union Oil Co. of California).

Composition adapted for addition to lubricating oil comprising the reaction product obtained by phosphosulfurizing a hydrocarbon lubricating oil fraction from which the most highly aromatic and the most highly paraffinic components have been removed. No. 2,476,813. John P. Buckmann and Loren L. Neff (to Union Oil Co. of California).

Improved mineral oil composition comprising a viscous mineral oil having in admixture therewith an oil-soluble magnesium sulfonate and an oil-soluble, phosphorus-and sulfur-containing reaction product obtained by reaction of phosphorus sulfide with a material selected from the group consisting of a dicyclic terpene and an essential oil predominantly consisting of a dicyclic terpene. No. 2,476,972. Everett W. Fuller and Ellwood M. Johnson (to Socony-Vacuum Oil Co., Inc.).

Catalytic decomposition of a hydrogen fluoride sludge by passing said sludge over a metallic decomposition catalyst comprising at least one metal selected from the group consisting of tin, lead, aluminum, chromium, zinc, nickel, iron, silver, antimony, cobalt, copper, magnesium bismuth, tungsten and cadmium, and separating the resultant products into a first fraction containing a major proportion of hydrogen fluoride and a second fraction containing a major proportion of polyenic hydrocarbons having

conjugated and non-conjugated unsaturation. No. 2,477,038. Herman S. Bloch (to Universal Oil Prods. Co.).

Hydrocarbon gasoline motor fuel containing a lead alkyl anti-knock agent and organic sulfur compounds in an amount sufficient to have a retarding effect upon the anti-knock-imparting properties of the anti-knock agent, together with an arsenite of an alcohol having the general formula $R(OCmHm)nOH$ in which m is an integer between 1 and 5 and n is an integer between 0 and 3 and R is selected from the class consisting of hydrogen and alkyl groups. No. 2,477,220. John L. Volz and Karl J. Korpi (to Union Oil Co. of California).

Lubricant composition comprising a major proportion of a hydrocarbon oil and an organic sulfur-containing compound which normally evolves hydrogen sulfide and an alpha-beta unsaturated aliphatic ketone. No. 2,477,244. James W. Gaynor (to Standard Oil Co.).

Converting hydrocarbons comprising contacting said hydrocarbons with a catalyst comprising a complex of a Friedel-Crafts type catalyst with a chlorinated ether. No. 2,477,290. Ralph W. Dornte and David W. Young (to Standard Oil Development Co.).

Lubricating grease composition comprising a lubricating oil compounded with a lithium-aluminum soap of a saturated fatty acid selected from a group consisting of stearic acid, palmitic acid and hydrogenated fish oil fatty acids. No. 2,477,296. Carl W. Georgi (to Enterprise Oil Co., Inc.).

Azeotropic distillation of hydrocarbon mixtures. No. 2,477,303. George R. Lake and Josephine M. Stribley (to Union Oil Co. of California).

Condensation products of an alkyl phenol with an aromatic dibasic acylating agent. No. 2,477,306. Eugene Lieber (to Standard Oil Development Co.).

Lubricating grease composition comprising mineral oil, structural carbon black, and petroleum resin obtained by propane extraction of deasphaltized petroleum residuums. No. 2,477,311. Arnold J. Morway (to Standard Oil Development Co.).

Extracting a hydrocarbon mixture which comprises admixing the hydrocarbon mixture with liquefied sulfur dioxide. No. 2,477,322. Edward F. Wadley (to Standard Oil Development Co.).

Improved lubricating composition adapted for use as a turbine oil comprising a petroleum oil having compounded therewith an alkylmercapto-acetic acid and an alkylsulfinyl-acetic acid, the alkyl group of each of the acids containing at least 12 carbon atoms. No. 2,477,356. Stephen J. Wayo (to Sinclair Refining Co.).

Photographic

Stabilizers for photographic silver-halide emulsions. No. 2,475,136. Newton Heimbach and Walter Kelly, Jr. (to General Aniline & Film Corp.).

Light-sensitive photographic material comprising piperine and benzoyl peroxide. No. 2,475,980. Alexander Murray (to Eastman Kodak Co.).

p-Hydroxy benzyl alcohol couplers for color photography. No. 2,476,008. Paul W. Vittum and Arnold Weissberger (to Eastman Kodak Co.).

1,3,5-Triazines as stabilizing agents for silver-halide emulsions. No. 2,476,536. Fritz Dersch (to General Aniline & Film Corp.).

Preventing the staining action of a bleaching bath during the bleaching of silver in an exposed and color-developed photographic emulsion containing a residual color coupler and a residual aromatic primary amino developing agent by treating with a silver bleaching bath containing the only oxidizing agent a water-soluble inorganic oxidizing agent, selected from the class consisting of alkali metal ferricyanides and persulfates, and a carbonyl compound selected from the class consisting of aliphatic aldehydes and dialkyl di-ketones. No. 2,476,544. Harold C. Harsh and James E. Bates (to General Aniline & Film Corp.).

Photographic developer containing dimethylol-urea, trioxane, sodium sulphite, potassium metabisulphite, boric acid, hydroquinone, and potassium bromide. No. 2,477,323. William H. Wood (to Harris-Seybold-Potter Co.).

Polymeric color formers from hydroxyl polymers containing reactive ketaldone groups with reactive methylene and amino color formers. No. 2,477,462. David Malcolm McQueen (to E. I. du Pont de Nemours & Co.).

Polymers

Production of viscous oil by copolymerization of aromatic olefin with monoolefin. No. 2,474,881. David W. Young and William H. Smyers (to Standard Oil Development Co.).

Modification of polyamides. No. 2,474,923. William Way Watkins (to E. I. du Pont de Nemours & Co.).

Alkylation in the presence of aliquid alkylation catalyst by introducing a mixture alkylatable organic compound in liquid phase and the liquid alkylation catalyst in a flowing stream to the inlet of a combined reaction and chilling zone. No. 2,474,924. Claude W. Watson, Clifford C. Burton and Loren P. Scoville (to Texas Co.).

Stabilizing an infusible, insoluble polymer produced by curing with benzoyl peroxide, a dihydroxy aliphatic hydrocarbon-dicarboxy hydrocarbon polyester. No. 2,475,002. Burnard S. Biggs (to Bell Telephone Labs., Inc.).

Onium-catalyzed phenolic resins. No. 2,475,005. James L. Brannon (to Bakelite Corp.).

Emulsion polymerization of vinylidene compounds by continuously feeding an aqueous emulsion of the vinylidene compound through a series of reaction zones under polymer-forming conditions and continuously feeding a substantial amount of additional vinylidene compound into at least one of the reaction zones following the first. No. 2,475,016. Willem Leendert Johannes de Nie (to Shell Development Co.).

Resin comprising an interesterification and copolymerization product of adipic acid, diethylene glycol, glycerol, and hexamethylene diamine. No. 2,475,034. Edward A. Lasher (to California Flaxseed Prods. Co.).

Composition of matter comprising a vinyl chloride polymer containing vinyl chloride, other monoolefinic material, and di-allyloxyethyl phthalate. No. 2,475,062. Pliny O. Tawney (to U. S. Rubber Co.).

Hydrochlorosilyl addition product with rubber. No. 2,475,122. Arthur J. Barry, Donald E. Hook and Lee De Pree (to Dow Chemical Co.).

Preparing solid copolymers by mixing benzalphthalide and styrene, and heating in the presence of a peroxy compound. No. 2,475,150. David T. Mowry (to Monsanto Chemical Co.).

Copolymer of styrene and benzalphthalimide. No. 2,475,161. Herman Harry Szmant (to Monsanto Chemical Co.).

Preparing a dihydroterpene-substituted phenol by reacting a dihydroterpene and a phenol in the presence of an activated siliceous catalyst. No. 2,475,201. Alfred L. Rummelsburg (to Hercules Powder Co.).

Polymerization of cyclic dimer of butadiene-1,3 or piperylene. No. 2,475,234. Anthony H. Gleason and Byron M. Vanderbilt (to Standard Oil Development Co.).

Polyallyl levulinate. No. 2,475,273. David E. Adelson and Hans Dannenberg (to Shell Development Co.).

Producing polymer of a beta, gamma-monoolefinic monohydric alcohol ester of a polybasic acid in liquid phase in the presence of metallic copper as sole polymerization catalyst under anhydrous non-oxidizing conditions. No. 2,475,296. Edward C. Shokal and Franklin A. Bent (to Shell Development Co.).

Producing a polymeric ester from a beta, gamma-monoolefinic monohydric alcohol ester of a saturated fatty acid by polymerizing said ester in the presence of a sole polymerization catalyst which is a member of the group consisting of copper, copper alloys and copper salts, under anhydrous non-oxidizing conditions in liquid phase. No. 2,475,297. Edward C. Shokal and Franklin A. Bent (to Shell Development Co.).

Plastic composition consisting of a resin selected from the group consisting of polystyrene, nuclear substituted methyl styrene polymer and styrenenuclear substituted methyl styrene copolymer plasticized with the lauric acid ester of diethylene glycol monoethyl ether. No. 2,475,299. Frank J. Soday (to United Gas Improvement Co.).

Polymers from nitropolyhydroxy alcohols and polyamines. No. 2,475,347. Paul Arthur, Jr. and Maynard Stanley Raasch (to E. I. du Pont de Nemours & Co.).

Polymer of a compound selected from the group consisting of an alpha-difluoromethyl styrene and an alpha-trifluoromethyl styrene. No. 2,475,423. Joseph B. Dickey and Theodore E. Stanin (to Eastman Kodak Co.).

Copolymers of N-alkylsulfonyl-and N-arylsulfonyl-vinylamines. No. 2,475,424. Joseph B. Dickey and Theodore E. Stanin (to Eastman Kodak Co.).

Preparation of orientable polymers of ethylene by polymerizing ethylene in a normally liquid, anhydrous, inert medium, in the presence of a catalyst of an organic halide, and a metal selected from the group consistnig of magnesium and zinc which organic halide and metal are capable of forming an organo-metallic complex. No. 2,475,520. Milton J. Roedel (to E. I. du Pont de Nemours & Co.).

Polymeric product obtained by conjointly polymerizing vinyl acetate with an ester of 9,10-dihydroxystearic acid and an olefinic alcohol containing a terminal methylene group selected from the group consisting of vinyl, allyl, methylallyl, chloroallyl, and bromoallyl alcohols. No. 2,475,557. Daniel Swern and Geraldine B. Dickel (to U.S.A. as represented by the Secretary of Agricuture).

Preparing fusible novolak resins from formaldehyde and a phenol having three reactive positions and selected from the group consisting of meta-cresol, meta-xylenol and phenol. No. 2,475,587. Howard L. Bender and Alford G. Franham (to Bakelite Corp.).

Continuous process which comprises subjecting a gas stream comprising ethylene and a peroxide catalyst to polymerization conditions of temperature and pressure to polymerize ethylene to a normally solid polymer. No. 2,475,628. Ellsworth E. McSweeney (to Standard Oil Co.).

Ethylene polymerization process with a catalyst having the general formula $(ROCOO)_2$ wherein R is an alkyl radical. No. 2,475,643. James E. Seebold (to Standard Oil Co.).

Polymerization of ethylene by diperoxy-dicarbonate ester catalysts. No. 2,475,648. George G. Stoner and Robert L. Savage (to Standard Oil Co.).

The molded, hard, infusible vulcanizate of sulfur and a copolymer of a glyceride drying oil and a diene hydrocarbon of a class consisting of cyclopentadiene and its lower homopolymers up to the pentamer. No. 2,475,664. Howard L. Gerhart (to Pittsburgh Plate Glass Co.).

Asphaltic composition of reduced brittleness comprising an asphalt and polyethylene dispersed throughout the asphalt. No. 2,475,699. Jan Cornelis Derksen (to Hartford National Bank and Trust Co.).

Reaction product of styrene with a fusible polyester of one mol of a glycol and a molar mixture of maleic anhydride and cyclopentadienemaleic adduct. No. 2,475,731. George S. Weith (to Bakelite Corp.).

Molding composition consisting of methyl methacrylate polymer, ethyl cellulose and acetone. No. 2,475,802. Harold A. Osserman (to Dictograph Products Co., Inc.).

Sulfonated copolymer of styrene and maleic anhydride. No. 2,475,886. Max T. Goebel (to E. I. du Pont de Nemours & Co.).

Solid polymer of a major proportion of a multi-olefin having 4 to 10, inclusive, carbon atoms per molecule with a minor proportion of a monoolefin having from 5 to 8, inclusive, carbon atoms per molecule. No. 2,476,000. William J. Sparks and Robert M. Thomas (to Standard Oil Development Co.).

Copolymers of butadiene and tetrahydrofurfuryl methacrylate. No. 2,476,027. Albert M. Clifford (to Wingfoot Corp.).

Copolymer of a mixture of monomers consisting of a non-conjugated aliphatic iso-olefin, containing only olefinic unsaturation, of 4-6 carbon atoms having a double bond in alpha position and a side chain in beta position; an aliphatic 1,3-conjugated diolefin; a vinyl substituted aryl compound and an aliphatic mono-olefin of 3-5 carbon atoms other than said iso-olefin, said copolymer having inherent tackifier properties. No. 2,476,064. Bruce L. Ritz and Herbert L. Johnson (to Sun Oil Co.).

Resinous condensation product resulting from the condensation of a mixture consisting of urea and formaldehyde and acrylonitrile or methacrylonitrile. No. 2,476,065. Jack D. Robinson (to Wingfoot Corp.).

Preparing a tetra-methylol melamine reaction product by reacting tetramethylol melamine with aniline. No. 2,476,127. Herbert J. West (to American Cyanamid Co.).

Reacting thiodiglycol with pentaerythritol in the presence of an acid catalyst, to produce a reaction product; and esterifying said reaction product with an esterification reagent selected from the group consisting of aliphatic monocarboxylic acids, anhydrides of aliphatic monocarboxylic acids, and acid chlorides of aliphatic monocarboxylic acids. No. 2,476,129. Frederick B. Augustine (to Socony-Vacuum Oil Co., Inc.).

Heating a liquid mixture of aqueous hydrobromic acid and an organosiloxane that is free of unsaturated aliphatic radicals, contains an average of less than 10 silicon atoms in the molecule, and contains, as the organic portions of the molecule, an average of at least 1, and less than 3, hydrocarbon radicals per atom of silicon. No. 2,476,132. Edgar C. Britton and Halbert C. White (to Dow Chemical Co.).

Stable, water-in-oil emulsion comprising water, a water-immiscible organic liquid, and an emulsifying agent, said organic liquid constituting the continuous phase of the system, the water constituting the discontinuous phase, and said emulsifying agent consisting of a polymer of an alkylsiliconic acid of the general formula R—SiO.OH, wherein R represents an alkyl radical of 12 to 28 carbon atoms. No. 2,476,308. David X. Klein (to E. I. du Pont de Nemours & Co.).

Production of a molding composition by impregnating regenerated cellulose staple fibers with a solution of a synthetic resin in a volatile solvent. No. 2,476,347. John Allan (to Celanese Corp. of America).

Composition comprising polyvinyl chloride and, as a stabilizer, a mixture of 2-phenyl indole and dibutyl diphenyl tin. No. 2,476,422. Robert I. Leininger (to Monsanto Chemical Co.).

Dispersion comprising an isobutylene-conjugated diolefin copolymer and a dispersing agent comprising water-dispersible protein and a saponification product of an organic acid composition selected from the group consisting of hydrogenated rosin, sulphonated tall oil and zinc resinate.

said dispersion containing a portion of said organic acid composition in unsaponified condition. No. 2,476,430. Edward H. Robbins (to Patent and Licensing Corp.).

In preparing polymeriaztion products in granular form, the step which comprises polymerizing an aqueous dispersion containing a vinyl halide from the group consisting of vinyl chloride and vinyl bromide, there being dissolved in the aqueous medium a heteropolymer of vinyl acetate and a compound selected from the group consisting of maleic acid and maleic anhydride. No. 2,476,474. Massimo Baer (to Monsanto Chemical Co.).

Thermal-reversible gel which comprises the interpolymer of a compound selected from the group consisting of acrylic acid and α-substituted acrylic acid with their amides. No. 2,476,527. Carl E. Barnes and William O. Ney, Jr. (to General Aniline & Film Corp.).

Polymer comprising the polymerization product of vinyl fluoride containing as a thermal stabilizing agent glyceryl monolaurate. No. 2,476,606. Frederick L. Johnston and Henry J. Richter (to E. I. du Pont de Nemours & Co.).

Heating and condensing with the formation of water of an ester of commercial stearyl alcohol and commercial stearic acid, with 1 to 2 molar quantities of polyethylene glycol. No. 2,476,609. Louis L. Lerner (to Consolidated Royal Chemical Corp.).

Resinous reaction product prepared from a dihydric alcohol, an alpha-beta-unsaturated dicarboxylic acid, phthalic acid and amonohydric alcohol ester of an acid selected from the group consisting of rosin acids and partially hydrogenated rosin acids. No. 2,476,714. Clarence D. Ender (to Hercules Powder Co.).

A polymerizable mass containing 2-vinylfluorene. No. 2,476,737. Edward A. Kern and Royal K. Abbott, Jr. (to General Electric Co.).

Light-stable composition comprising a resin composed of macromolecular straight carbon chains having chlorine atoms attached thereto with a stabilizing amount of a compound, $R_1C(NOH)\text{-}CO\text{-}R_2$, in which formula R_1 represents a substituent selected from the class consisting of the hydrogen atom, hydrocarbon groups, and hydrocarbon groups forming, with the group represented by R_2, hydrocarbon cyclic structures, and R_2 represents a substituent selected from the class consisting of the hydrogen atom, hydrocarbon groups, and hydrocarbon groups forming, with the group represented by R_1, hydrocarbon cyclic structures, with the proviso, that only one of R_1 and R_2 may be a hydrogen atom. No. 2,476,829. Claire D. Le Claire (to Firestone Tire & Rubber Co.).

Vinyl chloride resin compositions containing imidazolidines. No. 2,476,832. Robert A. Donia (to Firestone Tire & Rubber Co.).

Self-hardening composition of urea-formaldyhyde resins and a hydrated alkaline earth oxide. No. 2,476,919. Herman A. Scholz and John K. Wise (to U. S. Gypsum Co.).

Glycidyl allyl phthalate and related mixed esters together with polymers thereof. No. 2,476,922. Edward C. Shokal, Lynwood N. Whitehill and Clifford V. Wittenwyler (to Shell Development Co.).

Producing thermoplastic polymer of the ester of a beta, gamma-monoolefinic monohydric primary alcohol of 3 to 6 carbon atoms and a saturated monocarboxylic acid of up to 12 carbon atoms by heating said ester under anhydrous conditions to effect polymerization of said ester, catalyzed by having said ester in the presence of a nickel salt of a saturated monocarboxylic acid of up to 4 carbon atoms. No. 2,476,936. Richard Whetstone (to Shell Development Co.).

Self-hardening composition of melamine-formaldehyde resin and a hydrated alkaline earth oxide. No. 2,476,939. John K. Wise (to U. S. Gypsum Co.).

Vinyl ethers and polymers thereof. No. 2,477,218. Henry Theron Thompson (to General Aniline & Film Corp.).

Producing vinyl alkyl ether polymers of increased resistance to depolymerization by finely dispersing sulfur in the vinyl alkyl ether monomer and polymerizing the sulfur-containing monomer in the presence of a liquid diluent with a catalyst selected from the group consisting of aluminum chloride, iron chloride, stannous chloride, tin tetrachloride, zinc chloride, boron fluoride and the dialkyl ether addition products of boron fluoride. No. 2,477,225. Abraham O. Zoss (to General Aniline & Film Corp.).

Composition of matter which comprises a mixture of polyisobutylene and a hard, resinous, thermoplastic emulsion copolymer of styrene and a conjugated diolefin of from 4 to 6 carbon atoms per molecule. No. 2,477,316. William J. Sparks, Anthony H. Gleason and Per K. Frolich (to Jasco, Inc.).

Preparation of cationic water-insoluble phenol-formaldehyde condensation products containing omega-sulfonic acid radicals. No. 2,477,328. Harold M. Day (to American Cyanamid Co.).

Promotion of conjugated diene emulsion polymerization by trichloromethyl-substituted mercaptans. No. 2,477,338. James Emory Kirby and William Henry Sharkey (to E. I. du Pont de Nemours & Co.).

Composition resistant to the discoloring effects of heat comprising a halogen-containing vinylidene resin combined with triethyl lead hexyl maleate and dibutyl diphenyl tin. No. 2,477,349. William R. Richard (to Monsanto Chemical Co.).

Preparing monoaryl-substituted polymers having high molecular weight and convertible to sulfonic acids without material decomposition of the polymer chains by condensing predominantly propylene polymers with a mono-nuclear hydrocarbon of the benzene series in the presence of a condensation catalyst and an excess of said aromatic hydrocarbon. No. 2,477,382. Allen H. Lewis (to California Research Corp.).

Producing polymeric oil from petroleum products which comprises reacting an aromatic-rich hydrocarbon fraction with trioxymethylene in the presence of hydrogen fluoride. No. 2,477,538. Darwin E. Badertscher and Richard B. Bishop (to Socony-Vacuum Oil Co., Inc.).

Fluorinated polyaryl hydrocarbons. No. 2,477,543. Moushy Markarian (to Sprague Electric Co.).

Polyallyl ether compositions containing an orthosilicic acid ester. No. 2,477,548. John Robert Roach (to General Mills, Inc.).

Separating a mixture of polyhydroxy compounds from inorganic material dissolved therein, which comprises converting at least part of the polyhydroxy compounds to acetals in a non-aqueous reaction mixture in which the inorganic material is insoluble, separating the insoluble inorganic material from the reaction mixture, and converting the acetals to the polyhydroxy compounds to recover the mixture of polyhydroxy compounds with reduced ash content. No. 2,477,551. Harold Wittcoff (to General Mills, Inc.).

Separating highly condensed cross-linked polyether alcohols from an aqueous reaction mixture resulting from the alkaline condensation of glycerol and glycerol dichlorohydrin, which comprises removing water from the reaction mixture to leave a residue, extracting the residue with methanol, evaporating the methanol, treating the remainder with acetone acidified with anhydrous hydrogen chloride, to convert alcohols other than the highly condensed polyether alcohols to acetals and to form two phases, one containing the acetone and the acetals, the other containing the highly condensed cross-linked polyether alcohols, and separating the two phases. No. 2,477,552. Harold Wittcoff (to General Mills, Inc.).

Processes & Methods

Process for effecting catalytic hydrogenation of carbon monoxide by reaction with hydrogen during passage through a mass of fluidized powdered synthesis catalyst disposed in a vertical reaction zone wherein the catalyst is maintained in a state of dense phase fluidization by the gaseous fluid rising therethrough. No. 2,474,845. Frank J. Jenny and Earl W. Riblett (to Hydrocarbon Research, Inc.).

Drying gas by passing a moisture-containing gas upwardly through a cooling zone containing a body of granular material at a velocity sufficient to keep said granular material in suspension. No. 2,475,255. Walter F. Rollman (to Standard Oil Development Co.).

Separation of contaminants from industrial gases by scrubbing with a mixture of an aliphatic amine and an oil in the form of a dispersion. No. 2,475,334. Carl S. Oldach (to E. I. du Pont de Nemours & Co.).

Method of heat exchange in fluidized hydrocarbon conversion systems. No. 2.477,042. Harvey E. W. Burnside (to Standard Oil Development Co.).

Rubber

Synthetic rubber comprising a polymerizate of monomers selected from the group consisting of butadiene-1,3, isoprene, 2-chlorobutadiene-1,3,2,3-dimethyl, butadiene-1,3, and piperylene, and mixtures with material which has a single vinyl group, together with a compound having the general formula $(CH_2 = CR)_2A$ where A represents a member of the group consisting of phenylene, naphthylene and diphenylene and R represents a member of the group consisting of hydrogen, methyl and ethyl. No. 2,474,807. Dwight L. Schoene (to U. S. Rubber Co.).

Treating an aqueous emulsion polymerizate of a mixture of butadiene-1,3 and acrylic nitrile by incorporating a material selected from the group consisting of ammonium and substituted ammonium salts. No. 2,475,053. John S. Rumbold (to U. S. Rubber Co.).

Rubberlike polymer of a diene hydrocarbon plasticized with an alkenyl ether of diglycerol. No. 2,475,290. Kenneth E. Marple (to Shell Development Co.).

Vulcanizable composition comprising an unvulcanized sulfur-vulcanizable rubber, selected from natural rubber and synthetic, sulfur-vulcanizable copolymer rubbers, sulfur, an accelerator comprising an amorphous reaction product prepared by fusing benothiazyl disulfide, with a substituted guanidine. No. 2,475,583. Arnold R. Davis (to American Cyanamid Co.).

Rubberlike reaction product of polysulfide with chlorinated petroleum wax. No. 2,476,168. Ralph V. White and Harry L. Coonradt (to Socony-Vacuum Oil Co., Inc.).

Rubber-like composition comprising the copolymer formed by an allyl ester of an aliphatic, monocarboxylic acid containing from 12 to 18 carbon atoms, with a compound selected from the group consisting of open chain, conjugated, aliphatic diene hydrocarbons containing from 4 to 6 carbon atoms, open chain, conjugated, aliphatic diene monohalogenated hydrocarbons containing from 4 to 6 carbon atoms, and a mixture containing a major portion by weight of such a diene and a minor portion by weight of a copolymerizable compound capable of copolymerizing in aqueous emulsion with said diene and selected from the group consisting of styrene, methyl-styrene, alpha-methyl-paramethyl-styrene and acrylonitrile. No. 2,476,341. Karl H. Weber (to Armstrong Cork Co.).

Preserving a sulfur-vulcanizable rubber composition by vulcanizing a rubber composition containing a secondary aromatic amine antioxidant and in addition a small proportion of a compound of the formula $(C_6H_5\text{-}CH_2)_3Sn\text{—}R$ where R is an alkyl group having from 2 to 6 carbon atoms. No. 2,476,661. Edwin J. Hart (to U. S. Rubber Co.).

Producing a latex of rubber-like copolymer of butadiene and styrene containing carbon black by producing an aqueous suspension of the carbon black with a small amount of sodium-fatty-acid soap, sulfonated tall oil and ammonia. No. 2,476,819. Rexford E. Draman (to Firestone Tire & Rubber Co.).

Rubber-like copolymer of butadiene and styrene stabilized with a sulfide of the class consisting of diaryl stibine sulfides and diaryl arsine sulfides. No. 2,476,821. Harry E. Albert (to Firestone Tire & Rubber Co.).

Producing rubber-like coagulum of 1,3-butadiene and styrene, which coagulum contains a salt of a primary alkyl monoamine for activation of the vulcanization of the copolymer. No. 2,476,822. Alvin D. Miller (to Firestone Tire & Rubber Co.).

Tacky composition which comprises uncured, rubber-like copolymer of butadiene and styrene which includes as a tackifier a reaction product of an aldehyde containing from one to not more than four carbon atoms and a phenol which contains in a position other than the meta position a nonaromatic hydrocarbon radical containing about three to about eight carbon atoms. No. 2,476,824. Harry E. Albert (to Firestone Tire & Rubber Co.).

Stabilization of GR-S, etc., with a mixture of a trialkylphenol and a stannous salt. No. 2,476,833. Harry E. Albert (to Firestone Tire & Rubber Co.).

Rubbery copolymer of styrene, butadiene and vinylidene chloride. No. 2,476,967. Edward L. Fiedler (to Dow Chemical Co.).

Vulcanizing butadiene elastomers produced by emulsion-polymerization of polymerizable materials comprising at least 50% of a butadiene-1,3 hydrocarbon, which comprises incorporating in said elastomer a dinitroso compound of the class consisting of meta- and para-dinitrosobenzenes. No. 2,477,015. Bernard M. Sturgis and Joseph H. Trepagnier (to E. I. du Pont de Nemours & Co.).

Copolymerizing a major proportion of a normal olefin having 3 to 6, inclusive, carbon atoms per molecule with a minor proportion of a polyolefin having 4 to 10 carbon atoms per molecule, comprising the steps of dissolving a Friedel-Crafts type catalyst in an alkyl halide having less than 4 carbon atoms per molecule to form a catalyst solution. No. 2,477,018. Robert M. Thomas and Harold C. Reynolds (to Standard Oil Development Co.).

Composition of matter comprising a rubbery polymer having polymerized thereinto a major proportion of isobutylene and a minor proportion of a multi-olefin having from 4 to 14 inclusive carbon atoms per molecule; together with a curing agent, comprising a compound having a quinone dioxime nucleus; and a scorchiness preventing agent, comprising a compound having an aromatic acid radical. No. 2,477,280. Francis P. Baldwin (to Standard Oil Development Co.).

Vulcanization accelerators of the formula $N{=}C\text{-}S\text{-}NH\text{-}T$ where Ar is an

$$\begin{array}{l} | \\ Ar \end{array} \quad \begin{array}{l} | \\ S \end{array}$$

ortho-arylene nucleus and T is a 1,1-dioxo 3-thiolanyl group. No. 2,476,687. Lyndon B. Tewksbury, Jr. (to United States Rubber Co.).

Specialties

Ethylene polysulfide polymer lubricant. No. 2,474,859. Blyde A. Perkins (to Rockwell Mfg. Co.).

Soldering flux consisting of rosin, stearic acid, benzoic acid, and petroleum jelly. No. 2,474,863. William H. Rinkenbach and Arthur J. Clear.

Washing solution for fruit having high sugar content, comprising: propylene glycol, water, and ethyl alcohol. No. 2,474,915. Raymond E. Ramont.

Protecting metallic surfaces against tarnishing and corrosion by confining the metal surfaces with circumambient atmosphere and a sublimable corrosion inhibitor in an isolated space, the effective portion of said corrosion inhibitor consisting of a minor amount of an organic amine. No. 2,475,186. Jonas Kamlet (to Boyle-Midway, Inc.).

Decolorizing oil, by contacting with a water-insoluble magnesium silicate activated by treatment with an ammonium compound. No. 2,475,328. William A. La Lande, Jr. (to Attapulgus Clay Co.).

Compound lubricant: a blend of a mineral oil lubricating base with a small amount, sufficient to retard rust and corrosion, of a product obtained by reacting a mixture of an unsaturated fatty acid containing 8 or more carbon atoms and an aliphatic alcohol containing 8 or more carbon atoms with (one) a member of the group consisting of maleic acid and maleic anhydride and (two) a member of the group consisting of olefin oxides containing less than about 8 carbon atoms and glycols corresponding thereto and then neutralizing the reaction product with an aliphatic primary amine containing from 8 to 26 carbon atoms. No. 2,475,409. Herschel G. Smith, Troy L. Cantrell and John G. Peters (to Gulf Oil Corp.).

As an improved compound lubricant, a uniform blend of a mineral oil lubricating base, to retard rust and corrosion, a product obtained by reacting a mixture of sulfurized unsaturated fatty acid containing over 8 carbon atoms and an aliphatic alcohol containing over 8 carbon atoms with a member of the group consisting of maleic acid and maleic anhydride, then reacting the product with a member of the group consisting of olefin oxides containing less than about 8 carbon atoms and glycols corresponding thereto, then neutralizing the reaction product with an aliphatic primary amine containing between about 8 and 26 carbon atoms. No. 2,475,410. Herschel G. Smith, Troy L. Cantrell and John G. Peters (to Gulf Oil Corp.).

Dry cleaning soiled garments wherein soil redeposition is substantially prevented by tumbling the soiled materials in a chlorinated hydrocarbon dry cleaning solvent containing a small amount of calcium dichlorostearate. No. 2,475,418. Adam G. Aitchison (to Food Machinery and Chemical Corp.).

Composition for rendering fabric rot- and fire-resistant, comprising vinyl acetate vinyl chloride copolymer, n-butyl methacrylate polymer, tricresyl phosphate, triphenyl phosphate, zinc oxide, acetone, a solvent consisting of aromatic compounds, mineral spirits, inert pigment, and pentachlorphenol. No. 2,475,626. Martin Leatherman.

Oil base drilling fluid of the type employing blown asphalt as a plastering agent, a weight material and a petroleum mixing oil further characterized by the addition of sufficient naphthenic acid to bring the acid number between 0.2 and 1.5. No. 2,475,713. George Miller (to Oil Base, Inc.).

Synthetic lubricants by treating an unsaturated ketone having ten to thirty carbon atoms in each alkene radical with a catalyst selected from the group consisting of synthetic silica-alumina cracking catalyst and activated montmorillonite clay. No. 2,476,157. Ferdinand P. Otto (to Socony-Vacuum Oil Co., Inc.).

Lubricant consisting of a mineral lubricating oil and an oxidation inhibiting amine. No. 2,476,271. John D. Bartleson (to Standard Oil Co.).

Polishing composition which consists of a solution of rat fish liver oil and a light hydrocarbon liquid. No. 2,476,281. William Collins Brinton.

Antifouling composition comprising metallic copper and zinc oxide and a suitable water permeable, substantially water insoluble vehicle. No. 2,476,372. Ray E. Heiks (to Kennecott Copper Corp.).

Composition comprising a major proportion of bitumen and a minor proportion, sufficient to increase the adhesivity of said bitumen for mineral aggregates, of a heterocyclic nitrogen base salt of an oil-soluble sulfonic acid. No. 2,476,411. Felix C. Gzemski (to Atlantic Refining Co.).

Making a dry substantially neutral saponified rosin size having improved resistance to atmospheric oxidation which consists in isomerizing gum rosin by treating said rosin in the absence of a solvent with an isomerization catalyst selected from the group consisting of sulfuric acid and para-toluenesulfonic acid. No. 2,476,450. Bert M. Morris (to Hercules Powder Co.).

Hydrocarbon ether of hydrogenated cardanol dissolved in a mineral hydrocarbon oil to inhibit sludging of said oil. No. 2,476,696. Solomon Caplan and Peter L. Rosamilia (to Harvel Corp.).

Well drilling emulsion containing water and mineral oil emulsified therewith and a lignosulfphonic acid emulsifying agent No. 2,476,845. Reginald D. Dawson (to Shell Development Co.).

Printing composition comprising a coloring matter consisting in part of a phthalocyanine compound selected from the group consisting of copper-phthalocyanine and metal-free phthalocyanine and said liquid vehicle consisting in part of a liquid aromatic hydrocarbon said printing composition being distinguished by comprising a tin phthalocyanine compound, whereby said composition is stabilized against separation of the color through crystal growth. No. 2,476,952. Earl Edson Beard (to E. I. du Pont de Nemours & Co.).

Production of sugar cane wax. No. 2,476,974. Werner F. Goepfert (to Interchemical Corp.).

Quick-drying writing ink comprising a copper phthalocyanine of the benzene series having attached to the phenylene nuclei a plurality of heterocyclic sulfonamide groups selected from the class consisting of sulfonamidopyridinyl and sulfonmorpholidyl groups, a hygroscopic polyhydric alcohol, water and caustic alkali. No. 2,476,991. Raymond Lemuel Mayhew (to General Aniline & Film Corp.).

Activating a hydrophilic coagulating surface which comprises forming an aqueous solution of an oil and water soluble detergent which is a salt of an organic sulfoxy acid and which is more oil soluble than water soluble and contacting a hydrophilic coagulating surface with said solution. No. 2,477,318. Clarence H. Stevenson (to Standard Oil Development Co.).

Trade marks of the Month

A Checklist of Chemical and Chemical Specialties Trademarks

DEFLAMER. Homogeneous resin solution in organic solvents. 496,772. Eronel Industries.

MARK 5. Insecticides and insect sprays of the residual and contact types. 503,886. Dorsett-Jones, Inc.

Peel. Compound consisting in a dry powdered mixture of an enzymatic agent with a wetting agent for aiding in the removal of wall paper. 505,122. Paul-Lewis Labs., Inc.

PERFECT CIRCLE CATHARTIC. Oil base chemical additive for lubricating oils and liquid fuels. 506,258. Perfect Circle Corp.

(Symbol). Stock and poultry remedies, disinfectants, insecticides, and rodenticides. 506,432. Dr. Hess & Clark, Inc.

KLING-TITE. Paint in liquid and paste form. 513,528. Kling Tite Paint Products Co.

STRIPTEX. Chemical paint and finish remover. 522,738. Diversey Corp.

AGFA. Light-sensitive photographic material. 534,432. General Aniline & Film Corp.

CLEARGLIDE. Lubricating oils and greases. 535,605. Pate Oil Co.

(Symbol). Automobile cleaner and polish. 535,954. Hart Mfg. & Sales Co., Inc.

HART'S AUTO GLOSS "The Lazy Man's Polish." Automobile cleaner and polish. 535,955. Hart Mfg. & Sales Co., Inc.

HART'S. Automobile cleaner and polish. 535,956. Hart Mfg. & Sales Co., Inc.

FLEX-SYNOL. Synthetic drying oil. 537,-767. American Alkyd Industries.

TWIN ROSE. Fertilizer. 539,234. Twin Rose Products Co.

SOLINOX. Chemically modified vegetable oils for use in varnishes and lacquers. 539,360. Spencer Kellogg & Sons, Inc.

Old English. Paste wax, cleaning and polishing wax, dance floor wax, no rubbing wax, wax furniture polish, cream wax furniture polish, red oil polish, lemon oil polish, chemical paint brush cleaner, and wax for polishing automobiles. 539,-933. Boyle-Midway, Inc.

PENNCLEAN. Cleaner for dairy utensils and equipment. 540,450. Pennsylvania Salt Manufacturing Co.

LUBE SEAL. Chemicals for treating oil and gas well drilling fluids. 540,702. Oil Well Chemical and Materials Co., Inc.

(Symbol). Organic and inorganic bromides, salts, magnesium oxide, liquid calcium magnesium chloride and DDT for use as pharmaceutical, industrial and/or insecticidal chemicals. 540,848. Michigan Chemical Corp.

WINKIE. Liquid, soapless detergent for use as a household cleaning preparation. 540,849. Michigan Chemical Corp.

REP-LAC. Brushing lacquer. 540,885. Republic Paint & Varnish Co.

Lens Luster. Lens cleaner. 542,072. Barnett and Ramel Optical Co.

OLD-TANNER. Liquid shoe dressing. 543,-834. John H. Pfingsten.

FYR-KOTE. Fire-resistant finish coating in the nature of paint. 544,371. Fyr-Kote Co.

NYTAL. Talc and tremolite-bearing talc for use in paints and ceramics. 546,444. R. T. Vanderbilt Co., Inc.

MONAD. Ready mixed paints, varnishes, ready mixed floor paints, and ready mixed enamels. 547,752. Monad Paint & Varnish Co.

KLEERZ. Chemical agent to be added to liquid fuel oils for facilitating normal flow of the fuel oil through filters and small orifices. 547,-947. Synthetic Chemicals, Inc.

WOODEN SHOE. Ready-mixed paints and enamels. 548,159. Harrison Paint & Varnish Co.

AMRIN. Special mineral wax used in coating milk cartons. 548,612. Sinclair Refining Co.

(Symbol). Chemical compounds having water-softening qualities. 548,676. Oakite Products, Inc.

DO ALL. Detergent compound. 551,218. Armour and Co.

EASTERN STATES. Cleansing compound for dairy use. 551,251. Eastern States Farmers' Exchange.

EASTERN STATES. Furniture polish, mixed paints, varnishes, lacquers, wood stains, paint enamels, liquid paint and varnish removers, wood fillers, and creosote oil for wood staining purposes. 551,256. Eastern States Farmers' Exchange.

EASTERN STATES. Furniture polish, mixed paints, varnishes, lacquers, wood stains, paint enamels, liquid paint and varnish removers, wood fillers, and creosote oil for wood staining purposes. 551,263. Eastern States Farmers' Exchange.

Super Life. Chemical cleaning preparation for the removal of sludge, rust and impurities from the radiators of automotive vehicles. 551,617. Cussins and Fearn Co.

Super Life. Tar remover, metal polish, fabric cleaner, and grindstones. 551,618. Cussins and Fearn Co.

Cooper-Tox. Livestock insecticidal dip or spray. 552,575. William Cooper & Nephews, Inc.

MONSANTO. Synthetic resins and plastics for textiles. 554,912. Monsanto Chemical Co.

BARDEN. Kaolin clay. 555,752. J. M. Huber Corp.

VERMARCO. Hydrated lime. 556,740. Vermont Marble Co.

STEEL-AID. Lubricating and sealing compound for threaded joints. 557,712. Well Equipment Mfg. Corp.

Tallene. Tall oil pitch. 559,395. West Virginia Pulp and Paper Co.

JENOLITE. Rust inhibitors and rust-preventing compounds, degreasing compounds, keying solution for aluminum, and material for producing a cracked, black finish on metals. 559,615. Jenolite Ltd.

FERRALCANE. Rust removing preparation and a preservative against rust. 560,973. Ciba Ltd.

MICROSOL. Coal tar colors. 560,976. Ciba Ltd.

OXYPHENIN. Coal tar colors. 560,981. Ciba Ltd.

PLASTORESIN. Coal tar colors. 560,982. Ciba Ltd.

RENOSE. Chemical auxiliary agents in the textile industry. 560,983. Ciba Ltd.

Auto-Chlor. Cleanser for hand dishwashing. 561,389. Auto Chlor System, Inc.

MICRONIZED. Inks. 561,778. International Industrial Sales Co.

BW. Developer salts used in developing color of diazo-images photo-chemically printed on papers and cloths. 561,882, Charles Bruning Co., Inc.

AEROFUME. Insecticides. 562,184. Eston Chemicals, Inc.

Nukem. Sulfur cement. 563,951. Nukem Products Corp.

lustersuds. Soap for washing silks, wools, rayons, and other fine fabrics. 565,560. H. Kohnstamm & Co., Inc.

HY-WITE. Soap. 565,562. H. Kohnstamm & Co., Inc.

Beacon. Metal polish and liquid and powdered detergent. 566,213. Cincinnati Oil Works Co.

AMEROID WINTERPROOF. Anti-freeze solution. 566,507. E. F. Drew & Co., Inc.

Q. Silicate of soda. 566,545. Philadelphia Quartz Co.

Colony House. General household cleaner. 566,880. H. W. Hamilton Co., Inc.

FOAMEX. Water-soluble oil used for defoaming in textile softening, sizing, and finishing. 566,929. Haas-Miller Corp.

Colitho. Cleansing cream for removing printing inks, carbon inks, paints, and grease from the skin. 566,976. Columbia Ribbon & Carbon Mfg. Co., Inc.

Spook. Hand cleaner. 567,072. Spook Products Co.

PERIODICAL PRESS CORP., PHILA., PA.

Soldering flux consisting of rosin, stearic acid, benzoic acid, and petroleum jelly. No. 2,474,863. William H. Rinkenbach and Arthur J. Clear.

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